BUREAU OF HYGIENE AND TROPICAL DISEASES

TROPICAL DISEASES BULLETIN

Vol. 57 1960 No. 3

SUMMARY OF RECENT ABSTRACTS *

III. MALARIA†

Epidemiology

Two historical papers on malaria in the region of Venice have been published by CANALIS and SEPULCRI (pp. 408, 409).

VELLA (p. 684) examined the personnel of a military hospital in Accra, and their families, and compared them with the people of a nearby village. The parasite rates were lower in the military group than in the villagers, but most of the soldiers took antimalaria drugs on experiencing febrile symptoms. The military group lived in a protected environment, and though the soldiers themselves could be protected by drugs if moved into field conditions, their families might be subject to severe conditions if moved out of this protected environment.

In a discussion of malaria in infancy COLBOURNE (p. 919) concludes that in such places as Ghana and Sarawak it causes the deaths of about 5% of all children before they reach the age of 5 years. The infant parasite rate is the best measure available for estimating the intensity of transmission, but it should be interpreted with caution.

HENDRICKSE and KING (p. 511) suggest that in Ibadan, Nigeria, if malnutrition is excluded, malaria is the commonest cause of severe anaemia in infants. A survey in the Southern Cameroons indicated that parasite rates were significantly lower for infants and children under 5 at high altitudes than at low altitudes, but not in older children; GIBSON (p. 509) states that the sickle-cell trait was not correlated with the parasite rate.

TOUMANOFF (p. 509) shows that, after a prolonged campaign of insecticide control, malaria has been reduced but not eliminated in the area of Conakry,

* The information from which this series of summaries has been compiled is given in the abstracts which have appeared in the *Tropical Diseases Bulletin*, 1959, v. 56. References to the abstracts are given under the names of the authors quoted and the pages on which the abstracts are printed.

† For previous articles on malaria in this series, see the March and April issues of the *Tropical Diseases Bulletin* each year since 1939.

French West Africa. A case of congenital *Plasmodium falciparum* infection is recorded. In part of French Lower-Guinea there are deposits of bauxite, and in preparation for the exploitation of these TOUMANOFF (p. 1104) made a malaria survey, finding *Anopheles gambiae* and *A. melas*, both containing human blood. *A. melas* is widespread and seems to be the main vector. The parasite rate was up to 71·9% in children. Breeding of the vectors continues in the dry season though they cannot then be found in houses, and this leads the author to think that house spraying would not give effective control in that area. In riverine villages in Kwango, Belgian Congo, malaria is holo-endemic, with *Anopheles gambiae* as the most important vector; LEJEUNE (p. 3) found *P. falciparum* to be very common, *P. malariae* fairly common, and *P. vivax* rare. Overt attacks of malaria and deaths due to it were commonest between the ages of 6 months and 4 years; malaria seems to be the main cause of anaemia under 1 year, protein malnutrition from 1 to 3 years and thereafter hookworm infection.

In Uganda GONGORA and MCFIE (p. 1174) circulated a questionnaire to 76 dispensaries, for information on children under 6 years and their physical condition. The replies indicated a close association between evidence of intense malaria and mortality, and a lower degree of association between malnutrition and mortality.

A campaign for malaria eradication is likely to be launched throughout West Pakistan, and RAFI (p. 685) draws attention to the possible re-introduction of the disease by nomads, in whom infection rates with *P. vivax* or *P. falciparum* are high.

HO and FENG (p. 589) give an account of malaria in China, which may be divided into zones for this purpose. In the north the anophelines are palaearctic, malaria is seasonal and *P. vivax* is common. Further south the anophelines are oriental, malaria is seasonal or (in some areas) perennial, and *P. falciparum* is common. The official programme aims at extermination of malaria by 1960, and control involves the use of insecticides and drugs, and also treatment on traditional Chinese lines.

In the mountainous areas of Papua and New Guinea, the lowlands are malarious but the highlands are on the whole free, though epidemics do occur. PETERS *et al.* (p. 269) report that *A. farauti*, *A. punctulatus* and intermediate forms are known transmitters, and are found up to 6,000 feet. The development of industry has led to migration of men into the malarious areas, and measures of special protection have been instituted for these men. Industry is likely to create man-made malaria if not carefully supervised. It has long been maintained in New Guinea that malaria is not transmitted above a height of about 4,000 feet, but METSELAAR (p. 1214) has found it in a primitive community living there at 5,280 feet, where *A. farauti* and *A. koliensis* were found. The limiting factor is probably temperature, not anopheline prevalence, and near the usual upper limit there are probably considerable areas of anophelism without malaria.

FRAGA DE AZEVEDO *et al.* (p. 1103) investigated malaria in Timor, finding a spleen rate of 46·4% in children in the lowlands, and of 34·2% at higher levels. On the coastal lowlands the vector is *A. sundaicus*.

BLACK (p. 918) discusses the history of malaria in Australia, pointing out that there has been much traffic with peoples of the islands to the north, who may easily have introduced the disease time after time.

Transmission

LAIRD (p. 410) exposed wheat bran and yeast infusions (used for rearing *A. maculipennis atroparvus*) to the action of 2 μgm. DDT per ml. and found that bacterial growth was rapid, probably because the bacteria grew well in the dead larvae. Larvae which survived were more robust than usual owing to the abundance of food material and reduced inter-larval competition.

LAARMAN (p. 1104), in a study of *A. m. atroparvus*, found that smell is a strongly determinative factor in locating blood supplies, and that specific adaptation to a particular host is possible—the odour of rabbit blood was highly attractive, but cow blood was not. Heat and moisture attract the mosquito to the host.

RIOUX *et al.* (p. 270) discuss the members of the *A. maculipennis* complex found in southern France.

SHIPITSINA (p. 686) refers to studies in U.S.S R. which indicate that the basic factor in regulating the annual cycle of *A. maculipennis* is the length of daylight, and that when the days shorten to a certain point, diapause is initiated.

In Spanish Morocco *A. m. labranchiae* and *A. hispaniola* are the important vectors, and *P. vivax* is the predominating parasite. DIAZ MARIN (p. 409) notes that DDT has a very short residual action in the adobe houses of the area, and the insecticide programme needs modification. In an account of the anophelines of Tunisia JUMINER (p. 799) notes that *A. multicolor* and *A. hispaniola* are important vectors, *A. sergenti* is a secondary vector, and *A. algeriensis* is also probably a carrier. Members of the *A. maculipennis* group and *A. superpictus* are also found. In Algeria SENEVET *et al.* (p. 1104) found *A. plumbeus* breeding in a ditch, an unusual site for this arboreal mosquito.

In Northern Iraq *A. superpictus, A. sacharovi* and *A. m. maculipennis* are the important vectors of malaria. ABUL-HAB (p. 6) reports that in villages not sprayed with DDT *A. sacharovi* was found indoors throughout the year, and *A. superpictus* only between May and November.

In Uzbekistan the most favourable breeding places for *A. hyrcanus* are rice fields, reedy swamps and drainage water rich in calcium salts. KOGAY (p. 687) shows that breeding takes place in summer, and optimum conditions are at 27–28°C.

BÜTTIKER (p. 510) suggests that for Asian anophelines the diapause or quiescent period may be defined as hibernation, semi-hibernation or partial quiescence. In the first two the fat bodies form the nutritional reserve—with some feeding in semi-hibernation—and in partial quiescence the very hard, dry blood meals in the gut may form the reserve in hot, dry conditions, and feeding may occur from time to time. In a study carried out in Chekiang, China, LIU and CHEN (p. 801) observed that *A. hyrcanus* var. *sinensis* was able to hibernate in the adult stage, hibernation lasting about 3 months, and also that though hibernation was not observed in the larval stage, the larvae could withstand considerable lowering of the temperature. Eggs could withstand even more rigorous conditions, and hibernation in the egg stage appears to be possible.

HSU *et al.* (p. 799) give an account of the mosquitoes of Chengtu, Szechwan, China, naming 7 genera and 32 species, including several anophelines. WU (p. 800) gives an account of a mosquito survey of Chinpeng, Kweichow Province, China, naming a number of anophelines, some of which are important in malaria.

FOX and WEISER (p. 919) describe a microsporidian parasite of *A. gambiae* and discuss its elimination from colonies of mosquitoes.

LEWIS (p. 510) discusses the recognition of nulliparous and parous *A. gambiae* by examining the ovarioles.

CHRISTIE (p. 270) describes a new and improved method for collecting eggs of *A. gambiae*, in which an artificial pool, including a set of trays of soil, is used for analysing the oviposition behaviour of the mosquito.

He (p. 385) discusses in detail the role of the immature stages of anophelines in the regulation of adult numbers, particularly with reference to *A. gambiae*, which, as is well known, shows marked seasonal fluctuation. He argues that the cause of these fluctuations is probably to be found in the survival rates of eggs, larvae and pupae rather than of adults. These rates are influenced by overcrowding and shortage of food in the breeding water, predators, the stranding of eggs, the amount of vegetation and the ovipositing habits of females, and the formation of a surface film on water. In studying populations of *A. gambiae* larvae in pools before and after removing the natural fauna, he (p. 12) found strong evidence that predation occurred on a large scale, though it was not possible to name the predators.

GILLIES (p. 271) describes the methods he uses for determining the ages of female *A. gambiae*, by which he distinguishes 3 age-groups—(1) females taking blood for the first time (age 1–2 days), (2) those taking their second blood meal, not having laid eggs (age 2–3 days), (3) those that have already laid eggs at least once (age 4 days or more). By grading populations in this way he calculates average daily mortality, which he finds higher (13–15%) in the Pare district of Tanganyika (which is well inland) than in a coastal area (7–8%). He (p. 665) describes a simple autoradiographic method for distinguishing insects labelled with radioactive phosphorus or sulphur, which he has applied to the study of *A. gambiae*.

Work in the West Indies has indicated that some anophelines show a preference for certain age-groups of people on whom to feed, but in East Africa CLYDE and SHUTE (p. 272) could find no consistent preference in *A. gambiae*.

In the Pare area of Tanganyika, where cattle are enclosed out of doors at night, SMITH (p. 410) observed that 60–90% of the feeding population of *A. gambiae* fed on the cattle and mostly rested outside, though some entered huts for this purpose in the daytime. *A. pharoensis* fed early in the night but *A. gambiae* delayed for about 4 hours after entering the cattle enclosure. In the Taveta-Pare area of Tanganyika there are numerous springs which have been used for irrigation and which have led to breeding of *A. funestus* and *A. gambiae*, both of which are highly anthropophilic, though *A. gambiae* is more readily diverted to cattle if they are numerous. SMITH and DRAPER (p. 917) show that sporozoite rates are relatively low, but malaria nevertheless is holoendemic. There has been a general decrease in sporozoite rates and an improvement in the malaria position, possibly due to thinning of the forest and consequent drying of the atmosphere. *A. gambiae* in the Pare area was found to have a low sporozoite rate similar to that found in coastal areas where this mosquito may breed in salt water; SMITH and VAIL (p. 1105), however, found that the Pare *A. gambiae* would not breed in salt water.

MAFFI (p. 7) reports on the anophelines of Somalia where *A. gambiae* and *A. funestus* are widely distributed.

In the Southern Cameroons SERVICE (p. 510) reports that *A. gambiae* has

been found at 3,500 feet above sea level, but in the north of the area *A. funestus*, breeding in bare rock pools, streams, marshlands and forest pools, is the principal vector. In the Konakry region of French Guinea MARCHAL (p. 688) found various forms of *A. gambiae* breeding in pools of varying salinity near the sea shore. On the evidence of the shape of the pecten, a few were type form, more were *A. gambiae melas*, and still more were intermediate. He discusses the history of the separation of the two main forms.

MUIRHEAD-THOMSON (p. 591) describes a pit shelter devised for the study of *A. gambiae* and *A. funestus* in Southern Rhodesia, which has enabled good catches to be made.

BHATIA *et al.* (p. 117) give an account of the seasonal prevalence of anophelines near Delhi, where *A. culicifacies* is the only known vector, and has peak populations in April–May and August–December. BÜTTIKER (p. 591) has used temporary shelters and huts for collecting resting anophelines in Ceylon by pyrethrin spray, and has also noted a strong tendency for *A. culicifacies* to breed in tree holes.

A. sundaicus breeds in slightly brackish water, and SEN (p. 272) found that breeding was also correlated with the albuminoid ammonia content of the water near Calcutta.

SUNDARARAMAN *et al.* (p. 7) report on the anophelines of mid-Java where the important vectors are *A. sundaicus* (breeding in lagoons and fish ponds) and *A. aconitus* (in rice fields). *A. sundaicus* in the north has become resistant to DDT and shows a behaviouristic change in that it avoids treated surfaces by simply entering, feeding and leaving the premises with little or no indoor resting. In this way it also avoids dieldrin. *A. aconitus* has not shown resistance.

VAN DEN ASSEM and VAN DIJK (p. 411) review the distribution of anophelines in Netherlands New Guinea, where *A. farauti* is probably the main vector in lowland regions.

JONES (p. 8) describes a simple method of determining the sex of living *A. quadrimaculatus* larvae (4th instar).

LEWALLEN (p. 801) found paper chromatography useful in distinguishing *A. occidentalis* from *A. freeborni*.

VARGAS (p. 802) has assembled information on the distribution of Mexican anophelines, and DE BUSTAMANTE (p. 9) gives an account of the vectors in Brazil.

In Brazil SCHREIBER and MEMORIA (p. 9), and GUEDES *et al.* (p. 10) examined the salivary chromosomes of *A. argyritarsis* (which shows no mutations) and *A. strodei* (which shows many). This difference is probably related to the wider ecological adaptation of *A. strodei*. In Brazil *A. tarsimaculatus* occurs particularly in waters of low *p*H and *A. argyritarsis* at high *p*H (DE ANDRADE, p. 118).

In an investigation of the relationship between anophelines of the sub-genus *Kerteszia* and bromeliads in Brazil VELOSO (pp. 802, 1106) found that the most common, *A. cruzii*, tends to breed in bromeliads of large water capacity at heights of about 10 metres. The same is true of *A. bellator*, but *A. homunculus* is localized to smaller bromeliads at about 5 metres. Good control could probably be achieved by destruction of the large epiphytes at 10 metres or more, with special attention to the lower and smaller bromeliads only where they are found to be supporting the breeding of *A. cruzii* in

appreciable numbers. CHARLES (p. 1106) found *A. bellator* breeding in the upper reaches of rivers in British Guiana, and as this species has been implicated in transmission of malaria in that country, the opening up of the hinterland, by growing of cocoa for instance, could provide suitable conditions for breeding and consequent spread of the disease.

Aetiology: Pathology: Clinical Features

LACAN and PEEL (p. 5) discuss the malaria parasites of French Equatorial Africa, where *P. falciparum* is the common parasite, and *P. malariae* is also common. *P. vivax* is rare, and *P. ovale* is found occasionally and tends to have a focal distribution. The authors describe a method of restaining old blood films. LACAN (p. 5) investigated the *P. falciparum* gametocyte production of people in French Equatorial Africa. The proportion of persons showing gametocytes was maximum at 9 months of age and remained high until 5–6 years, when it fell rapidly. But the density of gametocytes fell much earlier, when premunition began to develop.

JEFFERY *et al.* (p. 1007) give an account of the clinical course of sporozoite-induced *P. falciparum* malaria in neurosyphilitic patients, 3 strains being used, of which the Panama strain was the most virulent, often giving rise to remittent or continuous fever.

In Rumania the duration of *P. vivax* and *P. falciparum* infections was found by CIUCĂ *et al.* (p. 410) not to exceed 2 and 1 years respectively, but longer periods have been experienced in Korean children.

To test the current belief that West Africans are resistant to *P. vivax*, BRAY (p. 686) exposed 30 Liberians and 2 "whites" to the bites of *A. gambiae* infected with the Madagascar strain of *P. vivax*. Only 1 Liberian developed visible blood infection but both controls developed malaria. There were certain peculiarities in the first-generation blood forms in the Liberian, but not in later generations.

From experience with induced malaria SCHNEIDER (p. 119) concludes that a short course of *P. vivax* infection does not permanently damage the liver.

In discussing the relationship between changes in the liver and malaria, SRICHAIKUL (p. 920) found that the thymol flocculation test was more often positive than the iodine test, but there was no relation to the severity of the malaria. Similarly there was no constant relation between the results of the serum protein lability tests, the amount of pigment, the degree of parasitaemia and the general pathological changes in the liver.

CANNON (p. 4) from Western Nigeria produces evidence that in women in whom the placenta is infected with malaria the proportion who give birth to premature babies is considerably higher than in women with uninfected placentas. Primiparae show the infection more often than others. Similarly, in Northern Nigeria ARCHIBALD (p. 1214) found, in women giving birth to infants in institutions, that if the placenta contained malaria parasites the infant was more likely to be premature than if the placenta was not infected, and that whatever the race or social status of the mother the infants from malarious placentae were lighter in weight than the others. Malaria in Northern Nigeria is seasonal and the general level of immunity is comparatively low.

It is now generally accepted that child carriers of the sickle-cell trait are protected against heavy infections with *P. falciparum*. RAPER (p. 592) quotes

findings which show that parasite rate, parasite count and parasite density index in general decline in AS or SS subjects, as compared with normal controls; but this difference was not seen in the first 6 months of life. At birth there is little difference between the haemoglobin of sickle-cell-trait carriers and normal infants because the proportion of adult-type cells containing either haemoglobin A or haemoglobin S is low. He describes experiments to elucidate the mechanism governing the different effects of *P. falciparum* infection in sickle-cell-trait carriers and normal persons, which seems to be related to the suitability of the haemoglobins for growth of the parasite, but they were inconclusive and the mechanism is still obscure.

Charles Wilcocks

MALARIA

In this section abstracts are arranged as far as possible in the following order:—Human malaria—*epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control;* Animal malaria—*monkeys, other animals, birds.*

RACHOU, R. G. Novos conceitos na classificação de endemicidade malárica. [**New Concepts in the Classification of Malarial Endemicity**] *Rev. Brasileira Malariologia.* Rio de Janeiro. 1958, Oct., v. 10, No. 4, 397–403. [19 refs.]

The English summary appended to the paper is as follows:—

"The author summarizes the classic concepts of endemic and epidemic malaria and how malaria endemicity has been measured. He describes Gabaldon's [this *Bulletin*, 1957, v. 54, 652] concept of constitution of malaria, with his ratio of endemicity and ratio of epidemicity, and Macdonald's [*ibid.*, 1958, v. 55, 229] concept classifying primarily malaria occurrence in two types, stable and instable malaria; although the used measures for classification differ, he thinks that these two concepts are quite comparable, Macdonald's stable malaria corresponding to Gabaldon's malaria of low epidemicity, and instable malaria of the first corresponding to malaria of high epidemicity of the second.

"Recognizing the great importance of the classification of the type of occurrence and of the endemicity of malaria, based on several common epidemiological indices, in a control program and its relative importance in the planning of an eradication program, the author believes that these classifications have no major significance in the development of an eradication program, when *zero* is the goal.

"So, relative numbers, as indices are, are of no import in an eradication program, that moves in direction and in function of this only number, *zero*. Even the classification of malaria endemicity, based on the absolute number of cases, has no interest, as, in programs of this type, 1, 100, 1000 or more

cases have practically the same significance, showing that malaria exists and, so, not yet eradicated; meanwhile, if this classification does not matter, the registration of these absolute numbers is of major importance in the progress of the program, for its valuation."

CEFALÙ, M. & GULOTTA, A. Su di un episodio epidemico occorso in fase di eradicazione della malaria in Sicilia. [**An Epidemic Episode during the Campaign to Eradicate Malaria in Sicily**] *Riv. di Malariologia.* 1959, June, v. 38, Nos. 1/3, 45–70, 10 figs. (1 on folding pl.) & 1 graph. [17 refs.] English summary.

The English summary appended to the paper is as follows:—

"A description is given of the malaria epidemic in Palma di Montechiaro (Agrigento) during 1956. The ascertained cases were 100; 79 in 1956 and 21 in 1957, but even the last 21 cases are to be ascribed to infections acquired in 1956 and the delay in the appearance is, very likely, due to the use of anti-malarial drugs spontaneously taken for prophylaxis or at the first appearance of the symptoms. The epidemic resulted only of infections by *P. vivax*.

"Investigations on the distribution of infections per age have shown a lesser incidence in young people of about 16–20 years of age; this behaviour can be explained by a residual immunity acquired through preceding infections, still active after a period of 6–7 years.

"The subjects were submitted, a few months after recovery from the primary attack, to further treatment, some with primaquine and some with pyrimethamine. Relapses occurred in the pyrimethamine treated group while in the primaquine group one relapse only was observed in an incompletely treated individual.

"The infections were acquired partly in the town, but chiefly in the surrounding agricultural areas; in any case transmission has always taken place inside dwellings.

"DDT treatment, in the town and in the surrounding fields, of all houses and all shelters (straw-huts included) was able to stop rapidly the epidemic, which is to be attributed to the invasion of the shelters by the local vectors (*A. labranchiae* and *M. superpictus*). In fact, the insecticide treatments in Palma di Montechiaro were partially interrupted in 1953–1954 and completely suppressed in 1955.

"The significance of an extra-domestic anophelism in Sicily is discussed with reference to the further evolution of malaria control."

GÖKBERK, M. C., EREL, D., EKER, E. & ALPAY, K. Sitma eradikasyonu esnasinda Yenice ve havalisinde görülen sitma epidemisi. [**Malaria Epidemic in Yenice Area under Malaria Eradication Scheme in 1957**] *Türk Ijiyen ve Tecrübî Biyoloji Dergisi.* Ankara. 1959, v. 19, 43–52, 3 figs. [40 refs.]

The English summary appended to the paper is as follows:—

"The Malaria epidemic in Yenice area, near Adana region, has been reported

in the first year of malaria eradication scheme in Turkey. 1483 malaria cases of Pl. vivax have been detected in the region while 1081 cases have been found in 18 villages of Yenice area. All of them have been cured with (600 + 300) + (300) + (300) mgr. Nivaquine in 3 consecutive days and suppressed with 300 mgr. Nivaquine and 25 mgr. Pyrimethamine weekly for 6 weeks. In the area the rainfall was high and rice fields were extensive in that year, although average rainfall, relative humidity and average temperature were 554·5–63·5–30·5 respectively. The altitude of the area is 30 meters. The people who live in that area settled and sleep outdoor during the Summer. Large numbers of laborers and other migratory people were also present.

"The vector was An. sacharovi. All the houses and premises of villages were sprayed in April 1957 with 2 gr. DDT/m^2. It was stated that the Malaria epidemic originated from the rice field workers as well as a few relapse cases of the vivax malaria which had been seen in previous years who acted as carriers of the parasites. The mathematical epidemic curve corresponded closely with that of the natural one.

"The authors concluded that behaviouristic resistance in An. sacharovi was evident and that physiological resistance to DDT was suspected."

GIL COLLADO, J. El *Anopheles plumbeus* Staeg. y otros mosquitos arboricolas en Madrid. [*Anopheles plumbeus* **and Other Arboreal Mosquitoes in Madrid**] *Med. Trop.* Madrid. 1959, Sept., v. 34, No. 3, 516–20.

LIU, Wi-Teh, LIU, Chin-Fa, HSÜ, Chang-Wen, TAO, Chao-Jen & WANG, Ching. [**A Preliminary Survey on the** *Anopheles hyrcanus* **Group from Hung-Ya and Chia-Kiang of Szechuan Province**] *Acta Microbiologica Sinica.* 1959, Nov., v. 7, No. 3, 217–22. [In Chinese.]

The English summary appended to the paper is as follows:—

"1. In the autumn of 1958, a preliminary survey on the *Anopheles hyrcanus* group in some parts of Hung-Ya and Chia-Kiang of Szechuan Province has been undertaken. Three forms of *A. hyrcanus* group were found, namely: *A. hyrcanus sinensis* small race, *A. hyrcanus sinensis* large race and *A. kweiyangensis.* In addition to these three forms, another uncommon form with the deck of the egg of medium width was found in some districts.

"2. According to our observations, *A. kweiyangensis* occurs chiefly in mountainous and hilly regions, the small race of *A. hyrcanus sinensis* occurs in plains near by hills, and the large race of *A. hyrcanus sinensis* is to be found almost everywhere.

"3. The small race of *A. hyrcanus sinensis* is more anthropophilic, while the large race of *A. hyrcanus sinensis* is more zoophilic. The former is the important transmitter of *Wuchereria malayi* in Pan-Lung district of Chia-Kiang. *A. kweiyangensis* prefers to suck human blood rather than animal. This fact seems to indicate that *A. kweiyangensis* is the more important transmitter of malaria than large race of *A. hyrcanus sinensis* in hilly regions of Hung-Ya and Chia-Kiang."

O'ROURKE, F. J. *Anopheles* **and the Problem of Malaria in Canada.** Reprinted from *Canadian Entomologist*. 1959, June, v. 91, No. 6, 346–52. [36 refs.]

"Mosquitoes capable of transmitting malaria occur in Canada but with adequate treatment of all cases there appears to be little chance of the disease becoming re-established under present conditions. It would be useful to determine experimentally the vector potential of all the Canadian species of *Anopheles*, so that in the event of future emergencies adequate control methods could be devised with the maximum economy."

[See also this *Bulletin*, 1953, v. 50, 474; 1956, v. 53, 846.]

MARTINS, C. M. Do diagnóstico diferencial específico entre o *Anopheles* (*Kerteszia*) *cruzii cruzii* e o *Anopheles* (*Kerteszia*) *homunculus* pelos caracteres dos adultos fêmeas (Diptera, Culicidae). [**Specific Differential Diagnosis between** *Anopheles* (*K.*) *cruzii cruzii* **and** *A.* (*K.*) *homunculus* **by Means of Female Adult Characters**] *Rev. Brasileira Malariologia*. Rio de Janeiro. 1958, Oct., v. 10, No. 4, 429–30, 7 figs. (3 coloured) on pl.

The English summary appended to the paper is as follows:—

"The author has found differences in the adult females of *Anopheles cruzii cruzii* and *Anopheles homunculus*. Such differences are in the palpal white coloration as well as in the general coloration of the abdominal tergites."

ARCHIBALD, H. M. & ROBERTSON, A. M. **Further Field Trials of Modern Antimalarials.** *J. Trop. Med. & Hyg.* 1959, Oct., v. 62, No. 10, 241–4.

The subjects of these trials were African children from 5 to 11 years of age living in 2 villages of Western Sokoto, Northern Nigeria. 143 children, all with numerous *Plasmodium falciparum* trophozoites in their blood were divided into 6 groups. The first 5 groups received single dose treatment with antimalarial drugs as follows:—

Group 1 received 25 mgm. of pyrimethamine;

Group 2 received 20 mgm. of Lapudrine (3:4-dichlorophenylisopropyldiguanide hydrochloride), a drug very similar to proguanil in its properties, but said to be more persistent and effective at low dosage [this *Bulletin*, 1958, v. 55, 127];

Group 3 received 300 mgm. chloroquine diphosphate base;

Group 4 received 300 mgm. chloroquine tannate base;

Group 5 received 300 mgm. chloroquine diphosphate base, as coated pellets;

Group 6 received no specific antimalarial drug.

The preparations given to groups 4 and 5 had been developed in an attempt to overcome the bitter taste of chloroquine.

Parasitaemia was determined at 24-hour intervals for 5 days after administration of the drug.

The results, which are shown in a table, indicated that Lapudrine has much the same activity as pyrimethamine, but neither of the newer chloroquine preparations effected as rapid clearance of *P. falciparum* trophozoites as did commercial tablets of chloroquine diphosphate.

There were 4 cases of persistent parasitaemia in the treated groups, one in group 2 (Lapudrine), one in group 4 (chloroquine tannate) and 2 in group 5 (chloroquine coated pellets). These failures were attributed to non-absorption of the drug.

It was concluded that Lapudrine might be a useful alternative to pyrimethamine, that there would be no benefit from putting chloroquine tannate on the market, but that coated pellets of chloroquine diphosphate would have a field of usefulness in the treatment of young children. *G. Covell*

MEYLER, L. Purpura met trombopenie na het gebruik van chloroquine-fosfaat. **[Purpura with Thrombopenia following Chloroquine Phosphate Treatment]** *Nederl. Tijdschr. v. Geneesk.* 1959, Nov. 28, v. 103, No. 48, 2427–8.

The English summary appended to the paper is as follows:—

"Report on a patient who may have suffered from purpura with thrombopenia, caused by chloroquine (Nivaquine); and on another patient who developed a severe haemorrhagic diathesis, resulting probably from a hypersensitivity to chloroquine diphosphate (Resochin)."

[The patients were being treated respectively for lupus erythematosus and rheumatoid arthritis.]

CLYDE, D. F. & SHUTE, G. T. **Survival of Pyrimethamine-resistant** *Plasmodium falciparum*. *Trans. Roy. Soc. Trop. Med. & Hyg.* 1959, Mar., v. 53, No. 2, 170–2.

After the administration of pyrimethamine for 20 months to the population of Mkuzi in Tanganyika, drug-resistant strains of *Plasmodium falciparum* emerged [this *Bulletin*, 1958, v. 55, 733]. Two village communities, situated 1 mile apart, Kilulu and Enzi, were chosen for the experiment; to the inhabitants of the former a weekly dose of pyrimethamine was given, while the population of the latter was not so treated, and served as a control. At the end of the period of drug administration the incidence of resistant infections among the children of Kilulu was 57%, which was nearly equal to that of 59% in the untreated children of Enzi.

The method of testing for resistance to pyrimethamine was to give 6 spaced doses of the drug (each ranging from 37·5–50 mgm. depending on age) over 2 weeks; the blood was examined for plasmodia at the end of the first and second weeks. Asexual parasites persisting at the end of the first week were considered to be resistant, since a single dose of 25 mgm. has been shown to be sufficient to clear the blood of non-resistant parasites in other hyperendemic districts of Tanganyika.

After the withdrawal of pyrimethamine suppressive therapy, the incidence

of fresh infections with resistant strains of *P. falciparum* in Kilulu declined to zero after 20 months. Similarly, in Enzi, fresh infections due to resistant strains had ceased to appear after 24 months. *J. H. Walters*

WHO CHRONICLE. 1959, Sept.–Oct., v. 13, Nos. 9/10, 348–56, 1 map. **Malaria Eradication throughout the World.**

The present position of malaria eradication throughout the world is described region by region in this report. Most countries have given up control, have accepted the concept of eradication and have organized accordingly. Practically all territories in the American region have undertaken eradication programmes, and the same is true of the Eastern Mediterranean and South-East Asian communities. A high proportion of the countries of the European region have done the same. In Africa pilot projects have shown that at the periphery of *Anopheles gambiae* distribution transmission can be controlled by residual insecticides alone, but in the tropical zone for a variety of reasons this is not so. There, residual spraying requires flawless organization which is almost impossible. In places where *A. moucheti* and *A. funestus* are the principal vectors residual insecticides have had encouraging results. It is now thought that antimalarial drugs, distributed by the village headman or in medicated salt, may be important in malaria eradication in this region. Though resistance on the part of vectors to dieldrin or to BHC has been reported in several areas in Africa, DDT resistance has not been encountered.

The status of the malaria eradication service varies from one country to another. In the Americas and in most of South-East Asia it has been kept separate from the public health service, but in the Eastern Mediterranean and European regions it is mostly incorporated in the national health services. Some countries have enacted legislation dealing specifically with malaria and covering many aspects of human behaviour which might affect control.

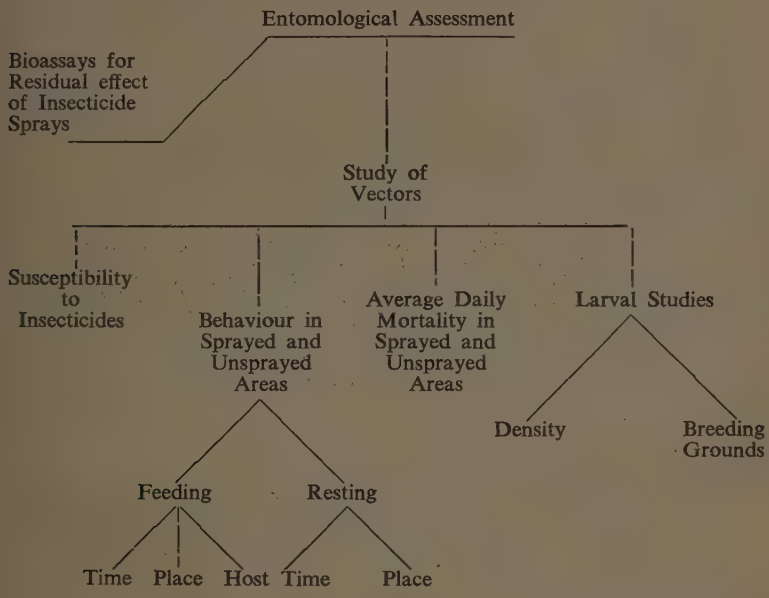
In the Western Pacific malaria transmission is perennial except in cold countries such as Korea and Japan. Here the attack on malaria has been delayed by unsettled social conditions. Japan and Taiwan are nearly free of the disease and most countries have adopted eradication programmes but sometimes their organization requires modification. Little is known of the present state of malaria in China. *T. H. Davey*

RAMAKRISHNA, V. **The Role of Entomologists in Malaria Control and Eradication Projects.** *West African Med. J.* 1959, June, v. 8 (n.s.), No. 3, 117–21, 1 diagram. [13 refs.]

The transition of malaria vector control from species sanitation at the breeding places to modern anti-adult control with indoor residual insecticides is briefly reviewed. Changes in susceptibility to insecticides in several vector species and in behaviour, particularly in resting habits, have indicated the need for more fundamental research in the laboratory and in the field than was generally envisaged when the hydrocarbon insecticides were first used for malaria control and eradication.

There is a brief general account of the functions of an entomologist in the

different phases of a malaria eradication campaign. These concern, as appropriate, all or some of the subjects usefully set out in the paper diagrammatically as follows.



D. S. Bertram

FRIZZI, G. I fondamentali aspetti teorici e pratici di un sessantennio di ricerche per la soluzione del problema malarico in Italia. [**Theoretical and Practical Fundamental Aspects of 60 Years' Research for the Solution of the Malaria Problem in Italy**] *Ann. d. San. Pubblica.* Rome. 1959, Mar.–Apr., v. 20, No. 2, 227–38. [22 refs.] English summary.

The period under review has seen the virtual eradication of malaria in temperate countries. This achievement has been accompanied by a thorough morphological, ecological and geographical study of the *maculipennis* complex. Furthermore, there has been considerable cytogenetic research which, in analysing the structure of the chromosomes of vector species, has shed new light on the classification, origin and evolution of the *maculipennis* complex.

More recently attention has been directed to the reaction of malarial vectors to insecticides. It is maintained by the author that the study of chromosome polymorphism, characteristic of some species, may well aid in determining the genesis of resistance to insecticides.

Also of significance are the newly developed techniques by which mosquitoes may be artificially inseminated. Artificial insemination may permit the laboratory culture of species which it has not normally been possible to breed in the laboratory.

The author concludes by reviewing methods for the future control of mosquitoes. *R. J. Wood*

DUMITRESCO, V., POPESCO, G., OLINESCO, A. & CORIJESCO, Veronica. Considérations sur l'activité antipaludique dans la République Populaire Roumaine. **[Observations on Malaria Control in Rumania]** *Santé Publique.* Bucharest. 1958, v. 1, Nos. 3/4, 113–32, 7 maps, 1 diagram & 1 graph.

The progress towards malaria eradication in Rumania has been described previously by CIUCA [this *Bulletin*, 1957, v. 54, 779 and 1389]. This paper, well written and illustrated by several maps, goes over some of the same ground but brings the story up to 1957. Until 1954 1,034 localities with a total population of 2,417,000 were protected by imagicidal campaigns. The incidence of malaria dropped from 2,127·9 per 100,000 in 1948 to 18·5, 5·3, 2·2, 1·3 and 1·1 per 100,000 in the years 1953 to 1957. Full imagicidal spraying has been discontinued in areas where malaria has virtually disappeared, being replaced by surveillance including radical treatment and subsequent weekly suppressant doses of antimalarial drugs to discovered cases, and "focal disanophelization". Nevertheless, the area of wall surface sprayed annually has been rising, not falling. In a zone extending along the southern and eastern borders, and a few isolated areas in the west, spraying is to be continued until 1961. Liaison with countries sharing common frontiers is satisfactory. *B. B. Waddy*

LIVADAS, G., MOUCHET, J., GARIOU, J. & CHASTANG, R. Peut-on envisager l'éradication du paludisme dans la région forestière du Sud Cameroun? **[Can Malaria be eradicated from the Forest Region of the South Cameroons?]** *Riv. di Malariologia.* 1958, Dec., v. 37, Nos. 4/6, 229–56, 2 maps. [35 refs.] English summary.

This paper describes the antimalaria campaign in the Cameroons, similar to that of CHASTANG [this *Bulletin*, 1959, v. 56, 1008] and, as regards urban aspects, that of VOELCKEL and MOUCHET [*ibid.*, 1108]. In the urban pilot zone of Yaoundé transmission has been virtually interrupted, and in the southern forest pilot zone holoendemicity has been reduced to low hypoendemicity. The authors conclude that eradication of malaria in the forest area is technically feasible, and that it would depend on solving the problems of administration and finance. [The general public health worker in Africa lives in dread of having *all* his limited staff and funds diverted from other not unimportant objectives to malaria eradication.] *B. B. Waddy*

i. INDIAN J. MALARIOLOGY. 1958, Dec., v. 12, No. 4, 261–636, numerous figs. [Numerous refs.] **Symposium on Resistance of Insects to Insecticides.**

ii. PAN AMERICAN HEALTH ORGANIZATION. **Seminar on the Susceptibility of Insects to Insecticides. Final Report. Panama, 23–28 June 1958.** 335 mimeographed pp., illustrated. [Numerous refs.] [1958.] Wash. 6: Pan American Sanitary Bureau, Regional Office of the World Health Organization, 1501 New Hampshire Ave., N.W., D.C., U.S.A.

WHO Technical Conferences on insect resistance [this *Bulletin*, 1957, v. 54, 1477; 1959, v. 56, 491] agreed on the desirability of international meetings of research workers to discuss the resistance problem. Accordingly, the first seminar was held in New Delhi in February–March 1958, sponsored by WHO in collaboration with the Government of India: a second seminar under the

auspices of the Pan American Sanitary Bureau and WHO was held in Panama City in June 1958. These two lengthy monographs have resulted from these meetings.

i. At the first seminar in New Delhi 69 participants took part, including 8 WHO consultants: the latter came from Europe and North America and the remainder from 14 countries of the Eastern Mediterranean, South-East Asia, and the Western Pacific Region. The papers were distributed subsequently in the form of the document *World Health Organization/Insecticides* 76. The seminar stimulated a desire for further information and 300 workers were accordingly invited to contribute papers to a special number of the *Indian J. Malariology*. 40 papers were received and form the substance of this special number of the *Journal*. Readers of this *Bulletin* will be familiar with much of the work of these investigators and the individual papers cannot be abstracted separately in the space available. The following general observations will indicate the scope of this publication.

The first 6 papers cover characterization of the resistance level and include a useful note on terminology and describe and discuss test methods for detecting resistance in mosquitoes and other insects of public health importance. There then follow 13 papers concerning the susceptibility of insects, principally mosquitoes, to insecticides in different parts of the world, *e.g.*, in the Tennessee Valley, Venezuela, Tanganyika, Java, India, United States and South Africa, with references to insecticide resistance in many other areas. Next there are 6 papers dealing with susceptibility of resistant strains to some newer insecticides, such as organophosphorus insecticides, diphenyl methane derivatives, and cetyl and myristyl bromoacetates and chloroacetates.

There are then 3 papers on the genetics of resistance and these are followed by 3 papers on the biochemical and physiological aspects of resistance to insecticides. 4 additional papers discuss other intrinsic factors relating to resistance and 2 papers deal with effects of environmental factors on susceptibility. The last 3 papers concern respectively the danger of resistance to insecticides, the need for a common information source on resistance problems in every field of biology, and a list of selected references on resistance of mosquitoes to insecticides from 1954 to 1958.

ii. The publication from the Pan American Sanitary Bureau is a report of the seminar held in Panama City. There were 83 participants from 18 countries in the Americas and in the Caribbean area and 4 consultants (from Europe, North America and Asia). The seminar was under the chairmanship of Dr. Pedro GALINDO of the Gorgas Memorial Laboratory. 28 papers were presented and these covered broadly the same subjects as did the first seminar, but with considerable emphasis on the Americas.

After listing the participants, the report sets out the titles of the papers, and these are followed by summaries of the papers and discussions. There is an account of the formation of 4 discussion groups, a list of 20 questions considered by them and their reports on those questions. Finally the papers themselves are reproduced in full.

It is clear that these two important seminars and the publication by the *Indian Journal of Malariology* will have added very considerably to the exchange of knowledge on the pressing subject of resistance to insecticides and will aid in co-ordinating an international research programme.

H. J. O'D. Burke-Gaffney

COLUZZI, M. Dati sperimentali sulla irritabilità di diverse specie di anofeli a contatto con pareti trattate con D.D.T. [**Experimental Observations on the Irritant Effect produced upon Various Species of Mosquitoes in Contact with Surfaces treated with DDT**] *Riv. di Malariologia.* 1958, Dec., v. 37, Nos. 4/6, 199–228, 1 fig. & 6 graphs. [46 refs.] English summary.

As long ago as 1947 KENNEDY noticed the irritant action which DDT has on mosquitoes, causing them to curtail their resting time on treated surfaces [this *Bulletin*, 1947, v. 44, 561]. MUIRHEAD-THOMSON first pointed out the deleterious effects of this on mosquito control in the field [*ibid.*, 1950, v. 47, 439]. The emergence of true behaviouristic resistance, in the form of races of *Anopheles albimanus* with enhanced response to this irritant effect, was suggested by TRAPIDO [*ibid.*, 1953, v. 50, 192] and recently confirmed by BROWN [*ibid.*, 1959, v. 56, 923], who developed a test method for measuring the mosquitoes' response. A slightly different technique has been used by DE ZULUETA [*ibid.*, 1960, v. 57, 103]. [It is likely that a standard WHO test, on these lines, will soon be promulgated.]

The author of the present paper has followed the original work of Kennedy by using a double compartment cage, one-half of which was lined with paper treated with deposits of DDT from spray formulations as used in the field. 8 species of anopheline were used in the tests, irritability being assessed by the average time to first flight after resting. This ranged from 1 to nearly 17 minutes in different cases. Resting time was longer on deposits from emulsion than from suspensions or kerosene solutions; but the different mosquitoes showed the same order of irritability in the results available. [On the other hand, one comparison reverses the order of *A. stephensi* and *A. gambiae* found by HADAWAY and BARLOW (*ibid.*, 1953, v. 50, 1085), who used a different technique.] The order of response to irritation of the mosquitoes was not related to their relative susceptibility.

After flying off the treated surfaces, the mosquitoes were caught and kept for 24 hours. Mortality records were low (0 to 12%) suggesting that repeated contact with treated surfaces is necessary for effective control. Some 500 of the *A. atroparvus* which had made one contact with a treated surface were examined chemically by Dr. A. S. PERRY. He found that the total pick-up of insecticide (DDT plus DDE) amounted to only 0·017 μgm. per mosquito, which would not be expected to kill them. *J. R. Busvine*

FRONTALI, N. & CARTA, S. Studi sulla resistenza degli anofeli agli insetticidi. IV. Declorurazione del DDT in ceppi sensibili e resistenti di *Anopheles atroparvus.* [**Studies on Insecticide Resistant Anophelines. IV. DDT Dehydrochlorination in Normal and Resistant** *Anopheles m. atroparvus* **Strains**] *Riv. di Parassit.* Rome. 1959, June, v. 20, No. 2, 107–10. [12 refs.] English summary.

The ability to convert DDT to DDE has been investigated *in vivo* in adults of two DDT-resistant (RAFM, RLAF) and two susceptible (SR, SA) strains of *Anopheles m. atroparvus.*

From the DDT and DDE content of mosquitoes exposed by tarsal contact to certain concentrations of DDT, the percentage of dehydrochlorinated DDT was calculated.

Between DDT-resistant and susceptible strains, two comparisons were possible: (1) when they were tested at the same dosage (1% DDT in risella oil), (2) when tested at dosages causing a similar level of mortality (1% and 4% DDT). The relative reliability of the two methods is discussed.

It is concluded that resistance to DDT in the strains of *A. m. atroparvus* investigated cannot be explained on the basis of the dehydrochlorination of DDT to DDE. *R. J. Wood*

MARTÍNEZ PALACIOS, A. Resistencia fisiológica al dieldrín en México de *A.* (*N.*) *albimanus* Wiedemann, 1821. [**Physiological Resistance to Dieldrin of** *Anopheles albimanus* **in Mexico**] *CNEP Bol.* Mexico. 1959, Apr.–June, v. 3, No. 2, 19–21.

The English summary appended to the paper is as follows:—

"Here is reported the first dieldrin resistant *A.* (*N.*) *albimanus* in Mexico. This happened in a locality where rice fields are their breeding places and where dieldrin resistant *A. p. pseudopunctipennis* were reported previously. The National Commission for the Eradication of Malaria in Mexico (CNEP) sprayed the interior walls of the houses of this locality with DDT and Dieldrin. The environs have been also sprayed from planes with unknown insecticides to fight cotton field pests. *A. albimanus* and *A. p. pseudopunctipennis* are the two main malaria vectors in Mexico. Up to date, resistance has been found in Mexico only in localities adjacent to rice fields."

[See this *Bulletin*, 1959, v. 56, 517 and erratum, 1010.]

BOWMAN, I. B. R., GRANT, P. T., KERMACK, W. O. & OGSTON, D. **An Inhibitory Effect of Mepacrine on the Catabolism of Glucose by** *Plasmodium berghei*. *Biochem. J.* 1959, Nov., v. 73, No. 3, Proc. Biochem. Soc. 42P–43P.

COX, H. W. **A Study of Relapse** *Plasmodium berghei* **Infections isolated from White Mice.** *J. Immunology*. 1959, Mar., v. 82, No. 3, 209–14.

Previous studies have shown that in mice infected with *Plasmodium berghei* a latent infection can be induced by treatment with mepacrine. Such mice are resistant to reinfection, while their parasites are infective to normal mice. Moreover, latent infections are liable to relapse whether they are produced by treatment or occur spontaneously [this *Bulletin*, 1958, v. 55, 866; 1959, v. 56, 806]. In order to determine the nature of the relapses, experiments were carried out in which the resistance of latently infected mice was challenged by reinfection with parasites from relapse and stock strains.

For this purpose mice were inoculated with a stock strain, and, after parasitaemia developed, latency was induced by daily intraperitoneal injections of 0·5 mgm. of aqueous mepacrine for 5 days. In the experiments groups of (a) treated infected, (b) untreated, and (c) treated normal mice, were each inoculated with (i) relapse, and (ii) stock strains of the parasite. The results were assessed by regular examinations of stained blood films, and the data—expressed as the proportion of deaths in each group—were subjected to statistical analysis.

It was found that in all cases there were more patent infections and more deaths among mice challenged with relapse strains of *P. berghei* than in those exposed to stock infection, or in control mice with latent infections. Moreover, relapse infections were not more lethal for normal mice than the stock infections. Hence it would seem that relapses were not due to increased virulence of the parasite. The author believes that in latent infections the parasites produce variants which reproduce in the immune host and also give rise to relapse infections. When transferred to new immune hosts the variants produce more patent infections and deaths than result from reinfection with the stock strain. *C. A. Hoare*

COWPER, S. G. & WOODWARD, S. F. **Observations on *Plasmodium berghei* Infection in White Rats: Blood Changes and Acquired Resistance.** *Ann. Trop. Med. & Parasit.* 1959, Apr., v. 53, No. 1, 103–12, 1 fig. [23 refs.]

The authors describe experimental investigations on the course of parasitaemia and polychromasia (reticulocytosis) in rats infected with *Plasmodium berghei*, on the development of acquired resistance in latent infections, and on the effect upon the latter of an antimalarial drug.

After recovery from a primary infection with *P. berghei*, rats exposed to two challenges failed to develop parasitaemia. When they were challenged for the third time—after treatment with pyrimethamine (Daraprim) or without such treatment—there was also no parasitaemia but autopsy showed enlarged liver and spleen with pigmentation. Inoculation of organ extracts from these rats produced parasitaemia in mice. In rats which were treated with the drug but not subjected to a third challenge there was no parasitaemia in subinoculated mice but pigment was present in their organs and there was increased reticulocytosis. Likewise, in mice subinoculated with material from organs of the first passage mice, the only evidence of infection was provided by the presence of pigment. Finally, when both drug and third challenge were left out, the rats showed pigmented spleens and their organs were infective to mice, producing parasitaemia, but mice of the second passage did not develop parasitaemia: they exhibited increased polychromasia and pigment in the spleen.

From these data it is concluded (a) that in resistant rats there is a persistent latent infection of the inner organs, produced by a form of premunition; (b) that pyrimethamine does not entirely sterilize the cryptic infection in organs; (c) that this infection is localized in the deep blood-stream of the liver, spleen and heart. *C. A. Hoare*

SAUTET, J., ALDIGHIERI, J. & ALDIGHIERI, R., with the technical collaboration of G. ARNAUD, M. AUSSEIL, C. RAMPAL & C. CASTELLI. Études sur la production expérimentale de la résistance à divers produits antimalariques d'une souche de *Plasmodium berghei*. [**The Experimental Production of Resistance in *P. berghei* to Various Antimalarial Agents**] *Bull. Soc. Path. Exot.* 1959, May–June, v. 52, No. 3, 331–45, 1 chart.

It is generally believed that resistance of malaria parasites to drugs may result from too low dosage but this has been shown to be untrue in some cases [this *Bulletin*, 1958, v. 55, 9]. The present report describes the authors' experience over the years 1957–1959 with 1,510 mice but it has not solved the

problem of how to avoid resistance. The procedures followed have been described previously [*ibid.*, 1956, v. 53, 156]. All treatments were given by mouth, starting 48 hours after inoculation, and continued for 5 days. The doses of the drug were based on those used in the treatment of man. Untreated controls were always used to make sure that the virulence of the strain had not altered. The drugs employed were pyrimethamine, chloroquine, quinine and Paludrine [proguanil]. Subinoculations were made with parasites which had been in contact with drug for 8 days.

The results obtained with these 4 drugs when small doses were given or when small doses were followed with increasing doses, appear to be equivocal regarding the production of resistance. When large doses of chloroquine were repeated over short periods the authors considered that resistance occurred. There is a short discussion on the practical implications of the finding.

J. D. Fulton

SAUTET, J., ALDIGHIERI, J., ARNAUD, G. & RAMPAL, C. Influence des vitamines B_{12}, C et K_1 dans le traitement des infections à *Plasmodium berghei* par la chloroquine. [**Effect of Vitamins B12, C and K1 on the Treatment of** *P. berghei* **Infections with Chloroquine**] *Bull. Soc. Path. Exot.* 1959, May–June, v. 52, No. 3, 276–81, 1 chart.

These 3 vitamins are believed to affect either red cell maturation, porphyrin and haemoglobin synthesis or the level of prothrombin. Lots of 45 mice were divided into 8 different groups involving the necessary combination of drug and vitamin. The dosage of chloroquine was 0·2 mgm. daily for 5 days and that for B12, C and K vitamins respectively 0·25, 0·1 and 0·01 mgm. over a 13-day period. The experiment lasted 30 days and survival rates are shown in a table.

The vitamins alone had no effect on the infection, while combination of C and K with chloroquine caused increased mortality. Chloroquine along with B12 proved more effective than the drug alone and resulted in longer survival and fewer deaths.

J. D. Fulton

TRYPANOSOMIASIS

In this section abstracts are arranged as far as possible in the following order:—African—*human, animal;* American—*Chagas's disease and other trypanosome infections. In each form the following order is followed:*—*epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control.*

GRANT, P. T. & SARGENT, J. R. **L-α-Glycerophosphate Oxidase and the Terminal Respiratory Pathway of the Bloodstream Form of** *Trypanosoma rhodesiense*. *Biochem. J.* 1959, Nov., v. 73, No. 3, Proc. Biochem. Soc. 42P.

See this *Bulletin*, 1957, v. 54, 1163.

ASHCROFT, M. T. **The Tinde Experiment: a Further Study of the Long-Term Cyclical Transmission of** *Trypanosoma rhodesiense*. *Ann. Trop. Med. & Parasit.* 1959, June, v. 53, No. 2, 137–46, 2 figs. [25 refs.]

The author records further observations on the "Tinde experiment", in which a strain of *Trypanosoma rhodesiense* (isolated from man in 1934) has been maintained by cyclical transmission through sheep (as well as in antelopes and monkeys) in the course of 23 years, during which period it retained its infectivity to man, as shown by successful inoculation of volunteers. The history of this experiment up to 1953 was reported elsewhere [this *Bulletin*, 1956, v. 53, 550], while in the present paper the author describes the results of a further study of this strain.

Late in 1955, 4 out of 5 volunteers were infected with the blood of infected rats, but attempts—made at the end of 1956 and beginning of 1957—to infect 5 and 6 men respectively by the bites of 2 infected tsetse flies failed, though these flies were able to transmit the infection to rats. However, 2 of the men who could not be infected cyclically were infected with the blood of these rats. According to the author, failure of the flies to transmit the infection to volunteers was due to the scanty metacyclic trypanosomes (maximum 40 per probe-test) present in the saliva of the flies in question. In this connexion it is recalled that there is a minimum infective dose of metacyclics [see *ibid.*, 1947, v. 44, 506]. Nevertheless, the "Tinde experiment" up to date has demonstrated that *T. rhodesiense* had not lost its infectivity to man after having been passaged through sheep for 23 years.

In analysing the behaviour of lines of the strain transmitted through different animals, the author points out that its virulence was increased by passage through monkeys and antelopes, and decreased by passage through sheep. The author discusses the bearing of these experiments on the relationship between the 3 species of the *brucei* group: He regards the physiological differences between the two human parasites as being due to the fact that *T. rhodesiense* is often found in wild mammals, whereas *T. gambiense* is mainly a parasite of man; on the other hand, *T. brucei* is not infective to man at all. *C. A. Hoare*

ASHCROFT, M. T., BURTT, E. & FAIRBAIRN, H. **The Experimental Infection of some African Wild Animals with** *Trypanosoma rhodesiense, T. brucei* **and** *T. congolense*. *Ann. Trop. Med. & Parasit.* 1959, June, v. 53, No. 2, 147–61, [32 refs.]

It is now possible, by serological tests of the blood ingested by tsetse flies, to identify the species of host upon which these flies feed [this *Bulletin*, 1958, v. 55, 1206]. However, the food preferences of the vector do not indicate that the animals fed upon are necessarily of importance as reservoirs of trypanosomiasis. In order to assess the epidemiological role of wild animals, the authors have followed the course of experimental infections with *Trypanosoma rhodesiense*, *T. brucei* and *T. congolense* in various wild animals, carried out in Tanganyika for 18 years, and have compared their results with those found in the literature. Most of the animals were young and came from tsetse-free areas, and they were subjected to bites of infected "clean" *Glossina morsitans*. Their blood was examined before and after the experiments, in thick blood films and by inoculation of rats.

The results of infections in individual host-species are described in great detail and cannot be summarized here. There appears to be a close similarity between infections produced by *T. rhodesiense* and *T. brucei*, providing strong evidence of the existence of wild reservoir hosts of the former species [the existence of which was subsequently demonstrated by direct experiment: see this *Bulletin*, 1959, v. 56, 698]. The wild animals can be divided into a number of groups, according to their susceptibility to infection with these two trypanosomes, as follows: (1) animals usually killed, with blood positive until death (Thomson's gazelle, dikdik, Blue Forest duiker, and a number of carnivores and monkey); (2) animals tolerant or resistant; among these some are (a) all infectible and parasites are detectable for a considerable time (common duiker, eland, reedbuck, oribi, bushbuck, impala, hyena); others (b) are usually infectible but trypanosomes are scanty in their blood (warthog, bushpig, porcupine), while (c) baboon is resistant to infection.

From a comparison of these experiments with the data on the food-hosts of *Glossina* revealed by blood tests it would seem that animals in group (1) are not usually fed upon by tsetse in nature, whereas those in group (2) are habitual sources of food, but high resistance (*e.g.* in porcupines and baboons) is not necessarily correlated with the importance of a host as a source of food. It is thought that the number of naturally infected flies may be correlated with the particular species or groups of wild mammals serving as food-hosts. Wild pigs appear to be more suitable hosts for trypanosomes of the *vivax* and *congolense* groups than for those of the *brucei* group. *C. A. Hoare*

ASHCROFT, M. T. **The Sex Ratio of Infected Flies found in Transmission Experiments with** *Glossina morsitans* **and** *Trypanosoma rhodesiense* **and** *T. brucei*. *Trans. Roy. Soc. Trop. Med & Hyg.* 1959, Sept., v. 53, No. 5, 394–9. [14 refs.]

Batches of *Glossina morsitans* were allowed for some days (4–6 usually) to feed on an infected animal and then daily on an "indicator" animal which was examined thrice weekly for evidence of trypanosome infection. Once this animal was positive, the flies concerned were kept separately, sexed, and their infection assessed from probe smears. Details of results are tabulated. About 3,000–4,000 flies of each sex were used for each of three trypanosome strains (one of *Trypanosoma rhodesiense*, two of *T. brucei*). Experiments lasted about 53 days, allowing fully adequate time for both male and female flies to develop gland infections. Flies examined for infection by probe smears numbered several hundreds for each trypanosome strain. Percentages of male flies infected were from 2·4 to 9·2, and for female flies from 0·3 to 3·7, the last-named value being that for the females of the associated males with highest infection rates (9·2%). Males survived longer than the females. This is at variance with findings of some, though not all, previous workers [this *Bulletin*, 1946, v. 43, 828; 1950, v. 47, 605; 1955, v. 52, 853; 1958, v. 55, 18] and may be explicable in terms of the technique of keeping the flies. It is not possible to determine if flies were more readily infected if fed on the first rather than later days after emergence.

It is suggested that similar work under more natural conditions is desirable to determine if laboratory findings of the above kind reflect events in nature. The need is for parallel experiments in which flies fed on an infected animal

in the laboratory are marked, released and examined for trypanosome infection at subsequent recaptures. *D. S. Bertram*

TENDEIRO, J. Nota prévia sobre o novo aparecimento de uma tsé-tsé, *Glossina palpalis palpalis* Robineau-Desvoidy, na Ilha do Príncipe. **[Preliminary Note on the Appearance of a Tsetse, *G. p. palpalis,* on the Island of Principe]** *Garcia de Orta.* Lisbon. 1956, v. 4, No. 1, 47–8, 1 pl. French summary.

FRAGA DE AZEVEDO, J., TENDEIRO, J., DE ALMEIDA FRANCO, L. T., DA COSTA MOURÃO, M. & DE CASTRO SALAZAR, J. M. Notícia sobre a tsé-tsé da Ilha do Príncipe. **[Information on Tsetse in the Island of Principe]** *Ibid.*, No. 4, 507–22, 16 pls. & 1 graph. English summary.

TENDEIRO, J. Notícia sobre a tsé-tsé da Ilha do Principe. **[Information on the Tsetse in the Island of Principe]** *Comun. Conf. int. Africanistas ocident., S. tomé.* 1956, v. 4, 251–2. [London] Sci. Coun. Afr. S. Sahara [1958].

[Summary taken from *Rev. Applied Entom.* Ser. B. 1959, Nov., v. 47, Pt. 11, 175–6.]

It is reported in the first paper that two small collections of *Glossina*, received from the Island of Principe in May 1956, were identified as *G. palpalis palpalis* (R.-D.), which had disappeared from the island as the result of a campaign more than 40 years before [*cf. R.A.E.*, B **4** 48]; the genitalia of both sexes are described and figured.

In the second paper, of which the third is a summary in four languages, an account is given of the reappearance of *G. p. palpalis* in Principe, and importation from the island of Fernando Po, some 125 miles distant, is considered to have been responsible, rather than the persistence of residual foci after the campaign of 1912–14 [*cf. loc. cit.*]. In a survey carried out with 2,029 traps of the Morris type [*cf.* **37** 110] or a modification of it, 106,000 tsetse flies were caught in the northern and central parts of the island, to which they seemed to be confined, the greatest numbers being found in the north and particularly in the north-east. Examination of the entire human population and of over 800 domestic animals showed no symptoms of trypanosomiasis and no trypanosomes; these were also not found in 6,500 tsetse flies dissected. A draft plan of campaign is described, the objects of which were to exterminate the tsetse and to prevent the introduction of trypanosomes into the island and of the tsetse into the Island of S. Tomé.

i. PAGE, W. A. **The Ecology of *Glossina longipalpis* Wied. in Southern Nigeria.** *Bull. Entom. Res.* 1959, Nov., v. 50, Pt. 3, 595–615, 6 figs.

ii. ————. **The Ecology of *Glossina palpalis* (R.-D.) in Southern Nigeria.** *Ibid.*, 617–31, 4 figs.

iii. ————. **Some Observations on the *fusca* Group of Tsetse Flies (*Glossina*) in the South of Nigeria.** *Ibid.*, 633–46, 1 fig.

The West African Institute for Trypanosomiasis Research established a field station in Benin province to investigate tsetse on the edge of the forest belt of Southern Nigeria. Conditions are here more humid than in the northern

savannah of Nigeria where entomological work had previously been carried out. Results for several species of tsetse are embodied in these 3 papers.

i. From 1953 to 1956, studies were carried out in a woodland savannah plain adjacent to a forested plateau in Benin province, Southern Nigeria. The plain included two permanent streams, some seasonal streams, and isolated pools with forest or other fringing vegetation. Some forest islands existed without associated surface water. The savannah grass was burnt annually. Game was plentiful. The area was not inhabited. *Glossina longipalpis* was ubiquitous, also *G. palpalis* in small numbers; other species were *G. fusca* and *G. medicorum* at forest islands; 3 specimens of *G. tachinoides* were taken at pools. A very thorough study on the ecology of *G. longipalpis* is reported, and included systematic catching of flies along a natural pathway traversing the area, marking and recapturing them, and relating the findings to seasonal environment, available hosts, vegetation, and so forth.

The permanent habitat of this species was in the forest islands, where pupae occurred under logs. The flies kept out towards the edge of such forest in the heavy rains. Seasonal savannah pools were temporary habitats in the rains and early dry season. In the dry season flies evacuate woodland savannah to concentrate in the forest islands. Feeding grounds were in transition forest and woodland savannah. Precipitin tests on 44 blood smears indicated that bushbuck was the principal host, with red river hog also important. Peak abundance is in the early dry season (November), with low densities in the later dry season. Increase becomes rapid after the early rains. Densities remain high during the rains and until the November peak.

Mature infections with trypanosomes of the *Trypanosoma vivax* group, *T. congolense* group, and *T. brucei* group were found in 21·5% of 4,360 *G. longipalpis*.

Partial clearing of riverine forest and forest islands, the permanent foci to which this species retreats in dry season conditions (when saturation deficiencies in more open terrain exceed 7 millibars) is suggested for its control. In its more southerly zone of distribution, regeneration may be too rapid, however, to make this an economical proposition.

ii. A similarly intensive study to that of *G. longipalpis* [see i. above] was made on *G. palpalis* in the same general area, from 1954 to 1957, but along a section of one of the permanent rivers in the area. Its banks were forested to different widths except where land was under cultivation. No major seasonal movements of fly were detected; the catches were always highest at open farmland and the edge of forest and lowest in dense forest. Small numbers of fly occurred in the savannah woodland throughout the year, in the main forest belt nearby and villages within this. On the river studied, populations were low and steady, with some rise in numbers in the third and fourth months of the rains. Breeding continued throughout the rains, as observed in dissections of females; pupae were not found in any numbers. Fly activity increased steadily between 7 and 10.30 a.m. and declined after 3.30 p.m. The commonest hosts available, as judged by spoors only, appear to be bushbuck, three species of duiker, red river hog and elephant. In dissections of 1,635 flies, 2·1% harboured mature infections of trypanosomes of the *T. vivax* group and the *T. congolense* group. It is interesting that *G. palpalis*, strictly riverine further north, is able to frequent the woodland savannah in small numbers throughout the year in this southern area fringing the forested belt of Southern Nigeria.

iii. In an area of secondary rain forest not far from the woodland savannah, where *G. longipalpis* and *G. palpalis* were studied intensively [see above], the following tsetse occurred: *G. fusca*, *G. tabaniformis*, *G. nigrofusca*, *G. pallicera* and, also, *G. palpalis*. *G. tabaniformis* was the predominant species, and *G. fusca* next in abundance. There were difficulties in recognizing *G. fusca* and *G. tabaniformis* under field conditions. A simple key and some text comment are offered for differentiation of the species of the *fusca* group encountered, but the females of these two species cannot be distinguished unless the flies are dissected for detail of genitalia.

The *fusca* group do not commonly attack man. They are readily observed resting head downwards on tree trunks and climber stems at 4–6 feet above ground level. Useful catches were possible, however, on fly rounds in which a white Zebu bull was used; 83% of fly were *G. tabaniformis*. A domestic pig was not a success, although a red river hog in a trap attracted nearly 50 flies of the *fusca* group in about half an hour. Precipitin tests for 35 *G. tabaniformis* gave 60% positive for red river hog and 23% positive for porcupine. As regards trypanosome infections, the following infection rates were obtained: *G. tabaniformis* (3·7% of 2,380 flies), *G. fusca* (14·9% of 579 flies), *G. nigrofusca* (26·7% of 105 flies) and *G. medicorum* (15·4% of 91 flies). Only the *T. vivax* group was found in the last species, but both *vivax* and *congolense* group in the other tsetse.

With its low infection rate and its restriction to forest *G. tabaniformis* is unlikely to be important as a vector. This appears to hold good too for *G. nigrofusca* in the part of Nigeria where these studies were made, since the fly, although heavily infected, stays in forest. Elsewhere, as in Ghana, it invades savannah and is likely to have great veterinary importance. In Nigeria, in the area studied, both *G. fusca* and *G. medicorum* extend, *via* forest islands and riverine vegetation, from forest into savannah and, with their high infection rates, must be of economic importance. *D. S. Bertram*

KERNAGHAN, R. J. & DAVIES, J. B. **Field Trials of the Control of *Glossina palpalis* (R.-D.) by Obstructive Clearing.** *Bull. Entom. Res.* 1959, Nov., v. 50, Pt. 3, 449–65, 8 text figs. & 2 figs. on pl.

Obstructive clearing, as originally defined [this *Bulletin*, 1953, v. 50, 1124], meant felling riverine trees across a water course to become overgrown with creepers, etc., and so block the flight routes of *Glossina palpalis*. This proved successful in narrow streams in Northern Nigerian savannah in eliminating fly [*ibid.*, 1957, v. 54, 1394]. Two larger scale trials of the method are here reported, and also a test of its worth as a means of keeping fly away from key points, a trade-route stream-crossing being flanked in the actual test by 300 yards of obstructive clearing in each direction. The main conclusions appear to be: obstructive clearing cannot be relied on to eliminate fly completely, although long stretches may be fly-free; it was ineffective in protecting the trade-route crossing. Causes of failure in complete control are as follows: river-beds over 10 ft. wide and 6 ft. deep which often lack sufficient vegetation to effect obstruction; zones of riverine forest too wide to fell (often it is swampy terrain); spate waters sweeping away felled timber and vegetation (likely to be most disruptive in the narrower water courses otherwise suitable

for obstruction); certain stretches of river with only limited numbers of particular trees (*e.g. Adina*) and little other vegetation to provide sufficient blockage; removal of felled wood as firewood.

A general conclusion is that with time an obstructive clearing is likely to resemble bad partial clearing, in which the clearing away and burning of felled trees and debris has been imperfect. There are indications that this imperfect partial clearing is, in fact, substantially successful in discouraging *G. palpalis*. Obstructive clearing was 40–50% cheaper to do than partial clearing with its time and labour required after felling in tidying up, burning, etc. In view of all this, it is thought that the practical answer may be to fell trees which provide top canopy, without much regard to what obstruction they may cause or maintain, and let them lie without burning, or clearing aside. This could perhaps be called "destructive clearing". There is some questioning of the suitability of the term "obstructive clearing" in the first place.

D. S. Bertram

HARTHOORN, A. M., PEARSALL, W. H. & HINDLE, E. **Game and the Tsetse Fly.** Reprinted from *Oryx*. 1959, Apr,. v. 5, No. 1, 16–21.

The Fauna Preservation Society here reproduce a letter from Dr. Harthoorn of the Department of Veterinary Physiology, Makerere College, Uganda, to *The Veterinary Record* about food intake and growth rate of the African buffalo compared with indigenous cattle. The main point raised for discussion is that it is probably more economical to increase the amount of protein harvested from wild buffalo than to make areas of Africa trypanosome free, by killing the game, and thus suitable for cattle. The buffalo thrive on grasses which do not support native cattle, and gain weight faster when the fodder is poor. Dr. E. HINDLE comments that it is wasteful to exterminate buffalo and similar game when recent studies [this *Bulletin*, 1958, v. 55, 1206] show that tsetse feed mostly on warthogs and bushpigs. Professor W. H. PEARSALL points out that domestic cattle survive with difficulty, in contrast to game, in Africa, and that overgrazing by cattle and the constant use of fire are liable to degrade the vegetation to such an extent that the surviving plants are fire-resistant only, or unpalatable to livestock, with little protein productivity.

B. R. Laurence

AMREIN, Y. U. & FULTON, J. D. **Attempts to Transfer Drug-Resistance of Trypanosomes** *in vivo*. *J. Protozoology*. Utica. 1959, May, v. 6, No. 2, 120–22, 1 fig. [14 refs.]

The object of the experiments described in this paper was to ascertain whether sexual processes occur in trypanosomes. In a previous work [this *Bulletin*, 1957, v. 54, 1060] it was demonstrated that strains of *Trypanosoma gambiense* resistant to two different drugs showed no cross-resistance to either when grown *in vitro*, thus indicating that the resistant character was not transferred from one strain to the other, as one would expect if syngamy had taken place.

In the present work similar experiments were carried out *in vivo* with strains of *T. rhodesiense* resistant to atoxyl and antrypol respectively. Mice infected with both drug-resistant strains were divided into a number of groups, some of which were treated with atoxyl and antrypol, while in another the mice were

treated with the two drugs together. In all these cases the infections were cured. Similar results were obtained with the drug-resistant strains in mice after passage through tsetse flies.

It is concluded that "These experiments carried out with two strains of trypanosomes in the mammalian and arthropod hosts fail to suggest the occurrence of sexual processes with accompanying cross-transfer of drug-resistance". *C. A. Hoare*

ASHCROFT, M. T. **The Relative Virulence of *Trypanosoma brucei* to Young and to Adult White Rats.** *Ann. Trop. Med. & Parasit.* 1959, Apr., v. 53, No. 1, 89–92.

The effect of *Trypanosoma brucei* upon rats of different weights and ages was assessed by observations on their longevity after infection. The strain used in the experiments had been passaged cyclically through sheep for 3 years and then by syringe through rats for 3½ months. Infection of rats differing in weight showed that animals of 50 gm. lived significantly longer than heavier ones. However, after the strain had been transmitted by syringe through young rats of 50 gm. for 5 months and inoculated into large and small animals, the virulence of the parasite was increased, for infected young rats survived for a shorter period than older ones. It was thus shown that the virulence of the trypanosomes was affected by the host through which they had been passed [see also this *Bulletin*, 1956, v. 53, 550]. *C. A. Hoare*

LINCICOME, D. R. **Observations on Changes in *Trypanosoma lewisi* after Growth in Calorically Restricted and in Normal Mice.** *Ann. Trop. Med. & Parasit.* 1959, Sept., v. 53, No. 3, 274–87, 1 fig. [17 refs.]

LINCICOME, D. R. **Serial Passage of *Trypanosoma lewisi* in the Heterologous Mouse Host. I. Development in Calorically-Restricted Hosts.** *J. Protozoology.* Utica. 1959, Nov., v. 6, No. 4, 310–15, 4 figs.

CORNEJO DONAYRE, A. Enfermedad de Chagas. Estado actual en El Perú. [**Chagas's Disease: Present State in Peru**] Reprinted from *An. Facul. de Med.* Lima. 1958, v. 41, No. 3, 428–53, 2 maps & 9 figs. on 8 pls. [47 refs.] English summary.

An account is given of the distribution, clinical symptoms and epidemiology of Chagas's disease in Peru, where it is present in the departments of Tacna, Moquegua, Arequipa, Madre de Dios, Amazonas and San Martin. The total number of cases recorded up to 1957 was 204, the majority of acute cases being in children under the age of 5, while chronic infection occurs both in adults and young people. 10 species of triatomid bugs have been found in Peru: of these *Triatoma infestans* is the vector of Chagas's disease in the south-western region and *Panstrongylus herreri* in the north. It is thought that the former was introduced into Peru from Chile, while *T. carrioni*, *T. dimidiata* and *P. rufotuberculatus* came from Ecuador. The most important reservoirs

of the disease are guineapigs, but naturally infected dogs and cats are also found in the endemic areas. The primitive living conditions of the population, who inhabit houses infested with bugs and are closely associated with domestic animals, are the most important factors in the epidemiology of Chagas's disease in Peru. *C. A. Hoare*

CORNEJO DONAYRE, A. Investigaciones sobre patología tropical en el Departamento de Madre de Dios. I. Enfermedad de Chagas. [**Investigations on Tropical Pathology in the Department of Madre de Dios. I. Chagas's Disease**] Reprinted from *An. Facul. de Med.* Lima. 1958, v. 41, No. 3, 409–27, 1 map & 10 figs. on 4 pls. English summary.

A survey carried out by the author in the department of Madre de Dios of Peru in 1957 showed that the epidemiological situation there would seem to favour the spread of Chagas's disease. Thus the human dwellings provide suitable conditions for the breeding of triatomid bugs and are overcrowded; moreover the inhabitants live in close contact with domestic animals (cats, dogs, pigs) which elsewhere in America serve as reservoir hosts of *Trypanosoma cruzi*. Although *Rhodnius pallescens* is present in some places and is naturally infected with this trypanosome, it did not become domesticated and only occasionally enters the houses. Many of the inhabitants of this department were examined clinically, by xenodiagnosis and parasitologically (blood films), but in no case were any signs of the disease or parasite detected. It is concluded that Chagas's disease is not a public health problem in the area in question. *C. A. Hoare*

RAW, I. **Some Aspects of Carbohydrate Metabolism of Cultural Forms of** *Trypanosoma cruzi*. *Rev. Inst. Med. Trop. São Paulo.* 1959, Sept.–Oct., v. 1, No. 3, 192–4, 1 fig. [12 refs.]

"Extracts from *T. cruzi* contain aconitase, fumarase and the following dehydrogenases: glucose 6 phosphate, 6-phosphogluconic, isocitric, triose phosphate and malic enzyme. The presence of 6-phosphogluconate splitting enzyme is reported and a possible pathway for CO_2 uptake during anaerobic glycolisis is suggested."

[See this *Bulletin*, 1956, v. 53, 978.]

See also p. 247, GALLIARD *et al.*, Atténuation de l'infection à *Trypanosoma cruzi* chez la souris blanche par différentes souches de *Borrelia*. [**Attenuation of** *Trypanosoma cruzi* **Infection in the White Mouse by Different Strains of Spirochaetes**]

GALINDO V., S. Frecuencia chagásica en 150 cardiomegálicos. [**Frequency of Chagas's Disease in 150 Cases of Cardiomegaly**] *Rev. Ecuatoriana de Hig. y Med. Trop.* Guayaquil. 1958, Oct.–Dec., v. 15, No. 4, 205–16, 4 figs. [29 refs.]

In 1956–1957 the author studied 150 patients with cardiomegaly in Guayaquil in order to determine the incidence of Chagas's disease among

them. The criteria of diagnoses are set out, but the author states that it was not possible to undertake xenodiagnosis: however, the complement-fixation test was done in all cases, together with full clinical, radiological and electrocardiographic examinations: ophthalmoscopic examination and serological tests for syphilis were also done.

4 patients were regarded on clinical grounds as having "pure" Chagas's disease: complement fixation was strongly positive (+ + + +) in 3 of them. 26 were regarded as "mixed" and of these 19 gave strongly positive complement-fixation results and 5 gave positive (+ +) results. There were thus 27 patients (18%) who were serologically positive for Chagas's disease. 17 patients died and in 4 in whom autopsy was made, the appearances in the heart suggested Chagas's disease. On the basis of the strongly positive complement-fixation tests, 14·6% of the patients would have had Chagas's disease.

H. J. O'D. Burke-Gaffney

BERNING, H. Consideraciones clínicas y etiologicas sobre la miocarditis en el estado Carabobo. **[Clinical and Aetiological Observations on Myocarditis in the State of Carabobo, Venezuela]** *Archivos Venezolanos de Patol. Trop. y Parasit. Méd.* 1959, July, v. 3, No. 1, 349–402, 22 figs.

The English summary appended to the paper is as follows:—

"This report is based on studies made in Venezuela during 1951–1954. The incidence of myocarditis among hospitalized patients in Valencia was 17·5%.

"The disease is divided into acute and chronic forms, the former being subdivided into subclinical and clinical stages; the latter into 3 stages: subclinical; clinical with cardiac hypertrophy and slight dilatation but without failure; and advanced with marked hypertrophy and dilatation and cardiac failure.

"The early stage without congestive heart failure was rarely seen; it was characterized by moderate right ventricular dilatation, increased venous pressure, normal circulating blood volume and circulation time, and irreversibility.

"Most (90%) of the cases which form the basis of this study (49 men with definite myocarditis) were seen in the terminal phase of the disease. There was then marked cardiac hypertrophy and dilatation, especially on the right; the duration of symptoms averaged about 10 months; congestive failure was pronounced; there were relative tricuspid regurgitation, positive liver and neck venous pulses, premature ventricular systoles or bigeminy, frequently right bundle branch block; increased circulating blood volume and prolonged circulation time; arterial oxygen desaturation. Death occurred either of congestive heart failure or ventricular fibrillation.

"The disease is considered a definite entity. Lues, bilharzia, hook-worm infestation, parasitic anaemia and nutritional deficiencies have been excluded as causes. Serological tests and xenodiagnosis indicate that this myocarditis is caused by *Trypanosoma cruzi*, which is transmitted to the rural population of Venezuela by the blood-sucking bug *Rhodnius prolixus* (genus Triatoma), which is an ubiquitous parasite upon the rural population living in huts. In endemic areas 80% of these bugs contain *T. cruzi*. As 60% of the population of Venezuela live in rural districts, this constitutes a major epidemiological problem."

LAUAR, K. M., DE OLIVEIRA, A. R. & DE REZENDE, J. M. Valor do tempo de esvasiamento esofagiano no diagnóstico da esofagopatia chagásica (prova de retenção). [**Value of the Time of Emptying of the Oesophagus in the Diagnosis of the Oesophageal Lesion in Chagas's Disease**] *Rev. Goiana Med.* 1959, Apr.–June, v. 5, No. 2, 97–102, 4 figs.

The English summary appended to the paper is as follows:—

"The authors demonstrate that the partial emptying of the esophagus, though with no increase in the caliber is suggestive of chagasic esophagopathy.

"It is based on two X-ray pictures of the esophagus taken one right after the other with no less than one minute interval from first to second film and with no further ingestion of contrast.

"The presence of residual contrast in the lower third of the esophagus leads one to suspect motor disorder of the esophagus and therefore calls for serologic investigation of Chagas disease."

LEISHMANIASIS

In this section abstracts are arranged as far as possible in the following order:—visceral, cutaneous, muco-cutaneous.

SMITH, R. O. A. **Bionomics of** *Phlebotomus argentipes*. *Bull. Calcutta School Trop. Med.* 1959, Jan., v. 7, No. 1, 17–21. [22 refs.]

WRIGHT, Mary I. **Kala-Azar of Unusual Duration, associated with Agammaglobulinaemia.** *Brit. Med. J.* 1959, May 9, 1218–21. [26 refs.]

This is a case report and discussion, and in the former there were three very exceptional features. The first of these was an incubation period in kala azar of 9 years, the second was the almost complete absence of gamma globulins in the serum of the patient and the third was that the patient developed amyloid disease.

The patient, aged 31, had lived in Poland and northern Italy but since the autumn of 1946 he had not been away from England. In December 1955 he developed a febrile illness associated with excessive sweating at night. The spleen and a few superficial lymph nodes, but not the liver, were enlarged. Blood cultures, skin tests and agglutination reactions were negative but a diagnosis of brucellosis was made and was considered to be supported by an apparent response to chlortetracycline. [It seems probable that this illness was the first clinical manifestation of the leishmanial infection.] In November 1956 he was again admitted to hospital with fever and it was then found that his spleen was enlarged and that the liver extended to just above the umbilicus. *Leishmania donovani* were found in smears of sternal marrow and he was treated with pentamidine. This, however, was not immediately followed by defervescence of the temperature and he was transferred to the Hospital for Tropical Diseases, London. Here the temperature resolved without further treatment and paper electrophoresis revealed an almost complete absence of

gamma globulin in the serum, but thereafter the amount of gamma globulin gradually rose to normal levels. His condition improved and he put on weight: in November 1956 he weighed 7 st. 11 lb. but by April 1957 his weight was 10 st. 4 lb.; a month later, however, he developed further fever and began losing weight. Another course of pentamidine was given and he again improved clinically. Proteinuria had been noted following the first course of pentamidine and this continued. The liver and spleen remained large and a liver biopsy carried out in March 1958 at the Hospital for Tropical Diseases revealed amyloid change.

The patient must have acquired the disease in Italy for he had not visited other endemic regions, and the 9 years which elapsed between his departure from that country and development of his first pyrexial illness constitute one of the longest incubation periods recorded for kala azar. [It is interesting to speculate whether the low serum gamma globulin values resulted from the infection or were a factor facilitating persistence of leishmaniae which would otherwise have been destroyed by the host's defence mechanisms during the long incubation period. The development of amyloidosis may also be a result of the extraordinary length of the illness and it too may be interrelated with the low gamma globulin values, for work with experimentally infected hamsters has shown that it may occur in them under similar circumstances and such animals do not develop the usual hyperglobulinaemia.] *A. W. Woodruff*

FEVERS OF THE TYPHUS GROUP

In this section abstracts are arranged as far as possible in the following order:—general; louse-borne typhus, flea-borne typhus, mite-borne typhus; rickettsialpox; tick-borne typhus; Q fever, other rickettsial diseases.

KALRA, S. L. **Progress in the Knowledge of Rickettsial Diseases in India.** *Indian J. Med. Res.* 1959, Sept., v. 47, No. 5, 477–83, 1 map.

This paper described very briefly the history and present state of rickettsial diseases in India. Scrub typhus extends to 29°40′ North and is found at altitudes from sea-level to 7,500 feet. Strains from different areas were immunologically distinct but those from the same area were identical. Murine typhus is widespread, and it is thought that in Kashmir, besides flea transmission, it may be spread by lice. Strains producing orchitis [presumably in guineapigs] were more severe than non-orchitic strains. Indian tick typhus is distinct from Rocky Mountain spotted fever but is close to boutonneuse fever though it differs in having no eschar. The disease is widespread but the incidence low. Epidemic typhus still occurs annually in Kashmir and may appear elsewhere if introduced by refugees. Cooperation in control is not complete and the disease remains a major public health problem. Q fever was first noted in India in 1953 and serological surveys have established the presence of infection in buffaloes, cows, goats and dogs. In man 162 of 3,326 sera were positive in titre of 1 in 8 or higher. The common form of the disease is a respiratory infection, but a generalized infection occurs which resembles typhus. *T. H. Davey*

KURZEJA, K. Die serologischen Untersuchungen bei dem ersten Q-Fieberfokus in Polen. [**Serological Investigations in the First Focus of Q Fever in Poland**] *J. Hyg., Epidemiol., Microbiol. & Immunol.* Prague. 1958, v. 2, No. 2, 148–54, 1 fig. [11 refs.]

Q fever occurred for the first time in Poland in 1956, when the disease was introduced with a herd of sheep imported from Rumania. 63 human cases were detected, although the total number was presumed to be greater. In complement-fixation tests with the Henzerling and Nine Mile strains of *Rickettsia burneti* antibody in titres of 16 or higher was found in 31 of 35 and in 23 of 28 acute and convalescent-phase sera. The incubation period of the illness ranged from 8 to 31 days, *R. burneti* was isolated from the blood of a patient and also from wool from the sheep concerned. Complement-fixing antibody to the Henzerling strain was found in 110 of 164 sheep (67%). The flock was destroyed, and no evidence of transmission of the infection could be obtained in serological investigations carried out on 959 local domestic animals in the following year. *D. J. Bauer*

SUREAU. P., with the technical collaboration of P. J. RAKOTOMAMONJY. Enquête sérologique concernant la fièvre Q à Madagascar. [**Serological Studies on Q Fever in Madagascar**] *Arch. Inst. Pasteur de Madagascar.* 1959, v. 27, 35–6.

The author examined the sera of 3 different ethnic groups in Madagascar for evidence of Q fever, by means of the rickettsial micro-agglutination test. Two groups raised sheep or cattle or both and 9 out of 45 were positive; the third did not have this association with domestic animals and 3 out of 58 were positive. The total positive results with human sera thus amounted to 11·6%.

He also examined 178 sera from pigs, cattle and sheep slaughtered at Tananarive abattoir, but coming from all parts of the island. The percentage of positives was 23%. The author points out that these results differed from those obtained by COURDURIER *et al.* in 1951 [this *Bulletin*, 1953, v. 50, 301] but attributes this to the fact that these authors had used the complement-fixation test, while he used the more delicate slide agglutination test [*ibid.*, 1956, v. 53, 986]. Attempts to isolate *Rickettsia burneti* are contemplated.

H. J. O'D. Burke-Gaffney

i. ROBSON, A. O. & SHIMMIN, C. D. G. L. **Chronic Q Fever. 1. Clinical Aspects of a Patient with Endocarditis.** *Brit. Med. J.* 1959, Nov. 14, 980–83, 2 figs. [25 refs.]

ii. ANDREWS, P. S. & MARMION, B. P. **2. Morbid Anatomical and Bacteriological Findings in a Patient with Endocarditis.** *Ibid.*, 983–8, 2 figs. on pl. [11 refs.]

i. A geophysicist aged 47 developed acute pneumonia while staying at Panama in December 1955, a scanty maculo-papular rash being present on the trunk. He was treated with sulphafurazole and became apyrexial and free from symptoms in 12 days. He returned to England and remained apparently well for 6 months. In May 1956 he fell ill again, this time with fever and signs of an aortic valvular lesion. A provisional diagnosis of subacute

bacterial endocarditis was made, although the absence of significant anaemia, leucocytosis, embolic phenomena and haematuria, together with persistently negative blood cultures, were puzzling aspects; arthralgia and arthritis were prominent features of the illness. Serological tests in September 1956 showed a high titre (1 in 2,000) of complement-fixing antibody for Q fever antigens, and guineapigs inoculated with blood samples taken in September 1956 and October 1957 developed antibodies to these antigens. In spite of intensive treatment with tetracyclines the patient's temperature fluctuated between 99°F. and 103°F. from May 1956 to December 1957, when left ventricular failure developed. Death occurred from cerebral haemorrhage and acute pulmonary oedema in January 1958. The final diagnosis was chronic Q fever infection with endocarditis, probably starting with the initial illness in Panama (a known endemic area of Q fever). In view of this experience, it is suggested that the possibility of Q fever should be considered in patients with subacute endocarditis from whose blood no bacteria have been isolated.

ii. This is a detailed account of the investigations made in the case described above. The presence of complement-fixing antibody in high titre to both antigenic phases of *Rickettsia burneti* in September 1956 suggests that the formation of antibody to Phase I antigen may be an indicator of chronic infection with this organism. The experiments which pointed to the presence of *R. burneti* in blood samples taken in September 1956 and October 1957 are described in detail. Autopsy findings included a cerebral haemorrhage and a distorted aortic valve with vegetations; guineapig inoculation showed that the vegetations contained large numbers of *R. burneti*, which were also isolated from the lung and spleen. Sections of the vegetations revealed microcolonies of rickettsia-like organisms.

[These papers are of great interest; *R. burneti* infection should clearly be borne in mind as a cause of subacute endocarditis. See also this *Bulletin*, 1959, v. 56, 818.] *R. S. F. Hennessey*

BARTONELLOSIS

Reynafarje, C.; Ramos, J. Estudios fisiopatologicos en la anemia de la enfermedad de Carrión. 1. Prueba de producción de los hematíes mediante el uso del hierro radioactivo [Reynafarje & Ramos]. [**Physio-Pathological Studies on the Anaemia of Carrión's Disease. 1. Study of Red Cell Production by Means of Radioactive Iron**] *Rev. Méd. Peruana.* 1958, Apr.–June, v. 29, No. 328, 74–9, 1 fig. 2. Tiempo de vida de los hematíes y prueba de Coombs [Reynafarje & Ramos]. [**2. Survival Time of Red Cells and Coombs Test**] *Ibid.*, 80–83, 1 graph. [10 refs.] 3. La fragilidad globular a la acción mecánica [Ramos & Reynafarje]. [**3. Red Cell Fragility Tests**] *Ibid.*, 84–7.

1. The authors, from Peru, made a quantitative estimation of red cell production in 11 patients in the anaemic stage of Carrión's disease. This was undertaken by the intravenous injections of ^{59}Fe, followed by estimation of radioactivity in blood samples after about 10 days. The methods used are described. The results are shown in a table. From these it is concluded that

there is an increased production of red cells in the anaemic stage of Carrión's disease, which is related to the intensity of the anaemia, the stage of development of the disease, the intensity of the *Bartonella* infection and the presence of secondary infection. It was also observed that the free protoporphyrin of the red cells was greatly increased, which indicated interference with haemoglobin synthesis.

2. Survival time of red cells was studied in 3 patients with Carrión's disease by the use of ^{51}Cr. The radioactive isotope was used to mark the red cells of a normal donor and these were injected into the patients, who were in the anaemic phase of the disease. During the next week, blood samples were examined. The results in the cases of 2 patients are shown in a graph and compared with normal controls; this shows that the survival time was much less when the cells were injected into patients with Carrión's disease. Nevertheless, many cells do survive for some time, which is regarded as a favourable factor for the use of transfusion in this phase of the disease. The Coombs test was negative in 15 cases in which it was performed.

3. Red cell mechanical fragility was estimated in 13 patients. The results are tabulated and show that in many cases of the anaemic stage of Carrión's disease the cells are more fragile than normal, but this factor does not seem to be related to the degree of infection or grade of anaemia.

H. J. O'D. Burke-Gaffney

YELLOW FEVER

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control.

See also p. 303, SURTEES, **On the Distribution and Seasonal Incidence of Culicine Mosquitoes in Southern Nigeria.**

PELLER, S. **Walter Reed, C. Finlay, and their Predecessors around 1800.** *Bull. History of Med.* 1959, May–June, v. 33, No. 3, 195–211. [28 refs.]

This is an interesting and important account of experiments made by the American physician S. FFIRTH in attempts to elucidate the transmission of yellow fever: the experiments were detailed in a thesis presented by him in 1804, and the work had been done a few years earlier. The author of the present paper remarks that Ffirth's name does not appear in Sternberg's (1889) article on yellow fever, or in the reports of the U.S. Army Yellow Fever Commission, or in certain standard histories of medicine, or Strode's *Yellow Fever* [this *Bulletin*, 1952, v. 49, 337]. It is therefore with particular pleasure that the reviewer is able to point out that Ffirth's work was well acknowledged by the late Sir Harold Scott [a former Director of the Bureau of Hygiene and Tropical Diseases] on p. 351 of his *History of Tropical Medicine* [*ibid.*, 1939, v. 36, 791].

Ffirth was thorough in his experiments. He exposed himself to direct contact with patients suffering from yellow fever, even in the same bed; he

fed cats and dogs on black vomit, and introduced this material into a pocket cut in the skin of a dog; he injected black vomit into the jugular vein of a dog, which died in convulsions within 10 minutes—but the same happened with water; he inoculated black vomit into a pocket beneath his own skin and into the conjunctiva; he inhaled vapour from heated black vomit; he swallowed samples of the vomit on several occasions; he frequently introduced serum from a patient below his own skin, and similarly introduced saliva, bile, sweat and urine.

"Thus, whether Ffirth inhaled or swallowed the material, whether he deposited it in the subcutis or in the conjunctiva, whether he used fresh or heated black vomit, whether the room temperature was normal or elevated to 100°F., he failed to develop the disease. He, therefore, concluded: *The disease cannot be communicated by the secretions or excretions*".

The author comments that it is just possible that Ffirth was immune and that this would have invalidated his conclusions, and this may have been the reason why his work was not referred to by Reed, though it was well known to Carlos Finlay, who was in contact with Reed. Whatever his actual state of immunity, Ffirth's courage is not to be doubted; the methods he used were closely followed by Reed 100 years later.

Finlay's deductions from Ffirth's work and from his own observations on the possibility that *Aëdes* could transmit the disease were valid, as other deductions from known facts (for instance Harvey's, in a different field) were valid. "Sometimes experimental evidence is necessary, another time it is incidental. With respect to yellow fever in America, the experiment had the power of persuasion which the derivation of the truth by deduction lacked."

This paper contains more than the account of Ffirth's work. It deals with Finlay and Reed, and references are given to experiments carried out by Cathrall as early as 1794, which anticipated those of Ffirth and were equally negative.

"Ffirth and Cathrall fell into oblivion. That is historical injustice. Their names should be reinstated in connection with the experimental clarification of the pathogenesis of yellow fever, as they are the most important predecessors of Crawford, Nott, Beauperthuy, Lutz, Finlay, Reed and associates."

Charles Wilcocks

RABIES

HUYGELEN, C. & MORTELMANS, J. **Quantitative Determination of the Dissemination of Flury Rabies Virus in the Central Nervous System of the Guinea-Pig after Intramuscular Inoculation in the Hind Leg.** *Antonie van Leeuwenhoek: J. Microbiol. & Serol.* 1959, v. 25, No. 3, 265–71. [17 refs.]

In the experimental work detailed in this article a quantitative determination was made of the virus content in different portions of the central nervous system of guineapigs inoculated with the Flury strain of rabies virus in the muscles of the hind leg. Previously the authors [this *Bulletin*, 1959, v. 56, 528] had described the typical ascending paralysis observed in guineapigs so

inoculated and now they sought to ascertain whether the upward spread of this paralysis corresponded directly with an increase of virus titre in the different sections of the nervous system, from lumbo-sacral cord to brain. For the purposes of their present studies the authors used a Flury virus at its 47th egg passage and having a titre of $10^{-3 \cdot 65}$; this virus was inoculated as a 40% chick-embryo suspension into the gastrocnemius muscles of guineapigs of 350–400 gm. weight. Suspensions of different portions of the nervous system and the liver of the guineapigs were made in normal saline and, after centrifugation, 0·03 ml. of each suspension was injected intracerebrally into 1-month-old mice. Generally 4 mice were used for each dilution and each mouse was observed for 21 days.

In the first experiment, in which 6 guineapigs were inoculated with 1 ml. of Flury virus, 4 of the animals were examined after death and 2 after the onset of paralysis. Samples taken, respectively, from the brain, bulb, thoracic cord and lumbo-sacral cord of these animals were injected intracerebrally into mice in serial 10-fold dilutions ranging from 10^{-1} to 10^{-4}. In 5 of the guineapigs, including 2 killed in the paralytic stage 11 days after intramuscular inoculation, the virus concentration was highest in the lumbo-sacral cord and lowest in the brain, while the titres in the thoracic cord and bulb were on an intermediate level and practically identical. As regards the sixth guineapig, in which no difference in the virus titres of the 4 portions of the nervous system could be demonstrated: the difference in the average length of incubation period in mice inoculated with a 10^{-4} dilution of lumbo-sacral cord (6–7 days) and in those inoculated with a 10^{-4} dilution of brain (13–14 days) indicated that in all probability a difference in virus titre would have been obtained if higher dilutions had been tested.

In the second experiment a comparison was made between the virus content of the lumbo-sacral cord and that of the brain during the incubation period. At the same time a suspension of the liver of each guineapig was inoculated intracerebrally into mice. In this experiment each guineapig received intramuscularly 2 ml. of the Flury virus suspension and at intervals thereafter, ranging from half-an-hour to 192 hours, one guineapig was killed and samples were taken from brain, lumbo-sacral cord and liver. For the detection of small amounts of virus during the first 4 days of the incubation period a highly concentrated (1 in 5) suspension of the material under test was used for mouse inoculation; thereafter from the 5th day onwards higher (10^{-1}–10^{-4}) dilutions of the samples were also used. Results showed that from the 3rd day onwards virus could be recovered from the lumbo-sacral cord. By the 6th day a marked increase in virus content had occurred in the lumbo-sacral cord, but no virus was yet recoverable from the brain. From the 8th day onwards the virus was found not only in the lumbo-sacral cord but also in the brain, the concentration in the former, however, being at least 1,000 times higher than in the latter. Inoculations of liver suspensions gave uniformly negative results.

From the results of these experiments the authors find it possible to draw some general conclusions. After intramuscular inoculation in the hind leg the virus is found at first in the lumbo-sacral cord, where it multiplies; thereafter it spreads in the direction of the brain, but the animal dies before the virus in the brain has reached as high a titre as in the lumbo-sacral cord. This propagation of the virus runs parallel with the symptoms of ascending paralysis observed in guineapigs after inoculation of Flury virus in the hind leg. The

results also show that during the incubation period the virus titre in some parts of the central nervous system may reach a very high level before the appearance of clinical symptoms. Thus in the case of the guineapig killed 192 hours after infection and at the time showing neither paralysis of the hind legs nor any other nervous symptoms, the LD50 end point in mice obtained by inoculation of the lumbo-sacral cord was at least 10^{-4}. *G. Stuart*

PLAGUE

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, rodent hosts, transmission, pathology, diagnosis, clinical findings, treatment, control.

WAKE, A. **Some Aspects of Variations of** *Pasteurella pestis*. **I. The Third Colonial Form of** *Pasteurella pestis*. *Japanese J. Med. Sci. & Biol.* 1959, Apr., v. 12, Nos. 1/2, 39–54, 6 figs. on 2 pls. [27 refs.] **II. Comparative Study of Strain M 1140 with the Third Colonial Form of** *Pasteurella pestis*. *Ibid.*, 55–69, 6 figs. on 2 pls. [26 refs.]

I. Several variant colonial forms of *Pasteurella pestis* have been described but this appears to be a new form. It is a smooth-looking whitish opaque colony with a regular entire edge. Microscopically the organisms are coccoid in form and have a strong affinity for fuchsin and methylene blue. This third colonial form is described as completely avirulent and non-protective. It has been isolated from animals which have survived a challenge of typical virulent *Pasteurella pestis*. The author suggests that the form has been overlooked by many workers ; it may have been regarded as a contaminant and not recognized as a variant of the plague bacillus.

II. Comparative antigenic studies of the third colonial form and an avirulent strain, M 1140, indicated that the two strains shared 2–3 somatic antigen fractions, but whereas the third colonial form was completely avirulent and unable to protect animals against a virulent challenge, M 1140, given as a living vaccine, was found to offer partial protection to mice against a virulent challenge and complete protection to guineapigs. It is therefore considered that strain M 1140 contains in fact significant traces of Fraction I antigen which is absent from the third colonial form. *H. J. Bensted*

TSOW, Y. S., CHAOY, C. H. & WANG, M. [**Isolation of** *Pasteurella pestis* **from Ticks** *Haemaphysalis* **and** *Dermacentor*] *Acta Microbiologica Sinica*. 1959, Nov., v. 7, No. 3, 205–8. [In Chinese.]

The English summary appended to the paper is as follows:—

"In 1955 the laboratory of plague prevention station of Chanyü district in Chilin isolated 2 strains of plague bacillus from 2 groups of Dermacentor tick forms on plague infected *Citellus dauricus*. In 1957 the authors isolated 4 strains of plague bacillus from 3 groups of Haemaphysalis and Dermacentor tick nymphs formed on healthy *Citellus*. In 1958, the laboratory of plague

prevention station of Changling district isolated 1 strain of plague bacillus from Haemaphysalis ticks on *Citellus*.

"The authors considered that the plague bacilli isolated from Haemaphysalis (S.P.) and Dermacentor nymphs might be very possibly transmitted through ova from the previous generation. Further research work on tick may be helpful to discover the natural focus of the plague."

YUNKER, C. E., KAISER, M. N., HOOGSTRAAL, H. & SALAH, A. El A. **Results of the HIPH-NAMRU 3 Asyut Plague Investigation, 1957. I. Background; Wild Mammals and their Ectoparasites (Siphonaptera, Acarina, and Anoplura).** *J. Egyptian Pub. Health Ass.* 1959, v. 34, No. 2, 43–55.

This is the first of a series of papers dealing with the results of an expedition to determine whether plague exists at the present time in Asyut, Egypt, once a focus of the disease. Rodents were trapped in the area and their ectoparasites (fleas, mites and lice) collected for identification. The host and ectoparasite data are given in the form of check lists with brief remarks on the ectoparasites.

The following were the host species examined: the Egyptian lesser jerboa (*Jaculus jaculus jaculus*), the house rat (*Rattus rattus*), the Norway rat (*R. norvegicus*), the house mouse (*Mus musculus*), the Cairo spiny mouse (*Acomys cahirinus*), a jird (*Meriones* sp.), and the Egyptian lesser gerbil (*Gerbillus gerbillus gerbillus*) and greater gerbil (*G. pyramidum pyramidum*). Four species of fleas were collected. The plague flea, *Xenopsylla cheopis*, was collected from the Cairo spiny mouse and the house rat; 96 specimens of this flea were collected from 12 rats in 4 days. One specimen (a female) of the human flea, *Pulex irritans*, was collected from a Cairo spiny mouse. The dermanyssid mite, *Allodermanyssus aegypticus* which is close to *A. sanguineus*, the vector of rickettsialpox, both morphologically and biologically, was collected from the Egyptian lesser jerboa, the Cairo spiny mouse and a species of *Rattus*. The tropical rat mite, *Ornithonyssus bacoti*, was collected from 3 species of *Rattus*, the Cairo spiny mouse, a jird and the Egyptian greater gerbil. Six species of laelaptid mites were collected, of which *Echinolaelaps echidninus* collected from a Norway rat is of some epidemiological interest as it is known to transmit the haemogregarine parasite, *Hepatozoon muris*, among rats. Of the four species of sucking lice in the collections, the commonest genus represented was *Polyplax*. The species *Eulinognathus aculeatus* was collected only from the Egyptian lesser jerboa. *M. G. R. Varma*

CHOLERA

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

FRIEDMAN, M. E. & ROESSLER, W. G. **Mercaptosuccinic Acid and Homoserine in the Reversal of a Norleucine Inhibition of** *Vibrio comma*. *J. Bacteriology*. 1959, Nov., v. 78, No. 5, 735–6.

JENKIN, C. R. & ROWLEY, D. **Possible Factors in the Pathogenesis of Cholera.** *Brit. J. Exper. Path.* 1959, Oct., v. 40, No. 5, 474–81, 2 figs. on pl. [24 refs.]

Employing the ligated rabbit intestinal loop technique of DE and CHATTERJE [this *Bulletin*, 1954, v. 51, 581] the authors examined various toxic fractions isolated from cultures of *Vibrio cholerae* and compared the results with those obtained when living cultures of *V. cholerae* were injected into ligated loops of rabbit small intestine. Lipopolysaccharide endotoxin and protein toxin [see Jenkin and Rowley, *ibid.*, 1960, v. 57, 123] failed to produce the fluid distension of the loops which was observed when living cultures were injected. Combinations of these two extracts with mucinase or injections of large doses of killed vibrios also failed to produce a positive loop reaction. When sodium salts of a number of organic acids (including lactic acid), which are known to be breakdown products of bacterial glycolysis, were injected into experimental loops it was found that loops injected with 20 mgm. or more sodium lactate showed a loop reaction very similar to that obtained by injecting living cultures of vibrios.

It was then shown that living cultures of *V. cholerae*, and also certain other bacterial strains known to produce positive loop reactions, in doses of 10^8 bacterial cells led to the production of lactic acid in their respective loops in concentrations well above 20 mgm./loop, whereas strains that did not give a positive loop reaction gave a concentration of lactic acid significantly below this figure; moreover the negative strains multiplied much more slowly than those producing a positive loop reaction. Other factors play a part, but lactic acid produced by the fast growing organism appears to be the most important cause of the fluid distension and the haemorrhagic necrosis of the intestinal epithelium found in cholera. *H. J. Bensted*

SENGUPTA, K. P., AIKAT, M. & AIKAT, B. K. **A Study of "Globulin Reaction" by Electrophoresis in Normal and Cholera Cases.** *Indian J. Med. Sci.* 1959, July, v. 13, No. 7, 612–14.

A characteristic difference was observed between the electrophoretic pattern of the serum protein obtained in the "acute" and in the "uraemic" stages of cholera. The first showed a significant rise in gamma globulin fraction without, however, showing abnormal turbidity tests. This was explained by the absence of any alteration in the albumin fraction, which was responsible for inhibiting precipitation. In the uraemic stage the main abnormality was seen in the alpha globulin. These findings are connected with the fact that gamma globulin changes are related more to immunological response, and alpha globulin changes to destructive lesions. *H. Lehmann*

AMOEBIASIS AND INTESTINAL PROTOZOAL INFECTIONS

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

TAYLOR, D. Jane. REES, C. W., REARDON, Lucy V. & WRIGHT, W. H. **Studies of the Virulence of Monobacterial Cultures of One Strain of *Entamoeba histolytica* in the Guinea Pig.** *J. Parasitology.* 1959, June, v. 45, No. 3, 269–73. [11 refs.]

The object of the experiments described in this paper was to ascertain whether any monobacterial cultures of *Entamoeba histolytica* produced a high incidence of heavy infections in their host. For this purpose a strain of amoebae (F-22) was cultivated in association with 13 different strains of bacteria belonging to 11 species, as well as with a mixed flora, with *Trypanosoma cruzi*, and in axenic cultures. The cultures were inoculated into guineapigs, which were fed on a purified diet, and the results were assessed at autopsy by noting the percentage of animals infected, average degree of infection (by means of a scoring system of marks from 0 to 4) and the mean day of death.

All the monobacterial cultures (except in the case of one strain grown with *Escherichia coli*), as well as the amoeba-trypanosome and axenic cultures, showed a low infection rate and low virulence, compared with the higher infection rate and virulence of the amoebae grown with a mixed flora. Hence it is concluded that the bacterial association *in vitro* is to some extent responsible for the virulence of the amoebae *in vivo*. *C. A. Hoare*

KASLIWAL, R. M. & SOGANI, R. K. **Serum Cholinesterase and Alkaline Phosphatase Levels and Serum Protein Fractions in *Entamoeba histolytica* Infections.** *J. Indian Med. Ass.* 1959, Aug. 1, v. 33, No. 3, 81–6. [22 refs.]

The liver function of 30 patients with amoebiasis and of 22 normal subjects was compared in Jaipur. Care was taken to ensure that the patients were suffering only from amoebiasis and that the results obtained could not be due to any other pathological process. Measurements of the icteric index, of serum bilirubin (VAN DEN BERGH), thymol turbidity, thymol flocculation, zinc turbidity and colloidal gold reaction showed no differences between the patients and the normal controls.

Results of estimation of serum cholinesterase (pseudo-cholinesterase), serum alkaline phosphatase and serum proteins are presented. The esterase was measured in *p*H Units after ALCALDE (*J. Lab. & Clin. Med.*, 1950, v. 36, 391) and the normal value was found to be 0·4 – 1·3 Units.

Details of results in the patients are not given but it is stated that the values were below normal in half of them (15). When the patients were grouped according to clinical liver involvement it was seen that low values were present in 3 of 11 with either no or with non-tender hepatomegaly, in 9 of 16 with tender hepatomegaly and in all 3 patients with frank amoebic abscesses. The alkaline phosphatase was normal in 28 patients and raised only in 2 of the 3 patients with amoebic abscess. The serum protein values too

were not generally altered in amoebiasis, though there was a tendency to hypoalbuminaemia and increase in gamma globulin when there was clinical evidence of liver involvement. *H. Lehmann*

DELAHOUSSE, J., PAILLET, R. & LEPROUX, P. Hémorragie surrénale et amibiase colique grave. (A propos d'une observation anatomo-clinique.) [**Adrenal Haemorrhage and Severe Amoebic Colitis. Report of a Case**] *Bull. Soc. Méd. Afrique Noire Langue Française*. Dakar. 1959, v. 4, No. 2, 203–7.

A fatal case in a European.

CHAUDHURI, R. N., ROY, N. & SAHA, T. K. **Mebinol in Amoebiasis.** *J. Indian Med. Ass.* 1959, Aug. 1, v. 33, No. 3, 79–81.

Dichloracetamide derivatives [see this *Bulletin*, 1958, v. 55, 1013, and 1959, v. 56, 617] have been shown to be effective amoebicides *in vitro*. 3 of them, Mebinol [M] I, M III, and M V, were used for clinical trial on proved cases of amoebiasis at Calcutta. The drugs were given orally in doses of 2 tablets thrice daily for 10 days (1 tablet of M I = 0·5 gm. and 1 tablet of M III and M V = 0·25 gm.) for adults. Of 11 patients treated with M I, 10 ceased to pass parasites in the stools before the 9th day of treatment and were relieved of bowel symptoms. Hepatitis in one of these patients was unaffected by the treatment; another patient with acute dysentery did not respond to it. Of 11 treated with M III 9 similarly responded and 2 failed to do so, both the latter having acute dysentery. The 13 treated with M V all recovered clinically and parasitologically under the treatment within 5 days; one developed a frank amoebic liver abscess shortly thereafter. No toxic side effects resulted from the treatments.

Of 6 patients treated with M I, and followed up for at least 3 weeks, 3 relapsed; of 5 given M III 4 similarly relapsed; of 8 given M V 2 relapsed within periods of 3 to 24 weeks' observation. This last drug therefore proved better than the other two, and is useful in uncomplicated amoebiasis.

[For previous trials, see *ibid.*, 1959, v. 56, 834 *bis*.]

A. R. D. Adams

THOMPSON, P. E., BAYLES, Anita, HERBST, Sheila F., OLSZEWSKI, Bronislawa & MEISENHELDER, J. E. **Antiamebic and Antitrichomonal Studies on the Antibiotic Paromomycin (Humatin)** *in vitro* **and in Experimental Animals.** *Antibiotics & Chemotherapy*. New York. 1959, Oct., v. 9, No. 10, 618–26. [13 refs.]

The methods used for testing this new antibiotic *in vitro* and *in vivo* were described [this *Bulletin*, 1956, v. 53, 1343]. The drug was used in the form of sulphate, in a culture medium which contained very little protein. Counts of amoebae were made after incubation for 24 or 48 hours at 37°C. and the effect of the drug on the bacterial population was noted in separate tubes. A standard rat test was used. Dogs infected rectally were treated by means of gelatin capsules twice daily, 5 days per week for 2 weeks. Thrice weekly the colon was aspirated and the amoebae counted. When the parasites could not be found in 12 specimens after treatment cure was assumed to have

occurred. Hamsters were used in studies on the hepatic form of the disease [*ibid.*, 1952, v. 49, 511] and 2 to 6 doses of drug were given daily for 4 days. The animals were then killed and the degree of infection estimated. Assay of the antibiotic in plasma was made by a disk-tray method with *Bacillus subtilis*. *In vitro* the effects on axenic cultures of *Trichomonas vaginalis* and *T. foetus* were studied after incubation at 37°C. for 48 hours in presence of the drug. *In vivo* trials were also carried out with peritoneal infections of *T. foetus* in mice with some success. *In vitro* the drug acted slowly against *Trichomonas* but action was apparently direct. In order to avoid the complication that paromomycin was active against *Escherichia coli* in the culture of *Entamoeba histolytica* with a single organism the bacillus was first rendered resistant to the antibiotic.

From these experiments the authors concluded that paromomycin had a direct effect against *E. histolytica* in culture. It was also effective against the rat infection. Cure was effected in a high percentage of dogs similarly infected and the treatment also gave favourable results against *Trichomonas* in these animals. In both rats and dogs the therapeutic index was high. The drug appears to be poorly absorbed from the intestinal tract and when absorbed is largely excreted in urine after high plasma levels which persist only for a few hours.

The authors concluded that paromomycin acts directly against *E. histolytica* as well as indirectly on the accompanying bacteria. Brief comparison is made of the efficacy of paromomycin with other antibiotics to the credit of the new substance and it is considered a useful addition to the drug armamentarium, especially for treatment of intestinal amoebiasis and bacillary dysentery, being endowed as it is with high activity and low toxicity. The results with hamsters also suggested that it may have some application in the treatment of liver infections by *E. histolytica*. *J. D. Fulton*

i. Lopez Elias, F. & Oliver-Gonzalez, J. **Treatment of Intestinal Amebiasis with Paromomycin (Humatin).** *Antibiotic Med.* New York. 1959, Oct., v. 6, No. 10, 584–5.

ii. Carter, C. H. **Paromomycin (Humatin) in the Treatment of Intestinal Amebiasis. A Preliminary Dose-Range Study.** *Ibid.*, 586–8.

i. This antibiotic is stated to have been found active against *Entamoeba histolytica* both *in vitro* and *in vivo*. Its oral toxicity is low. It was used as the sulphate salt in doses of 4 to 20 mgm./kgm. daily (in 2 or 3 divided doses) for the treatment of 20 adults, and in slightly larger doses in the treatment of children, who were passing cysts of *E. histolytica*. In all these cases parasites vanished from the stools, which remained free from them thereafter for the periods of subsequent study (in most cases 90 days).

ii. 79 patients in a mental hospital ranging in age from 2 to 30 years were given 5 to 30 mgm./kgm. of the antibiotic daily for 1 to 5 days. Of those treated with 12·5 or more mgm./kgm. daily for 5 days (49 patients) 44 ceased to pass *Entamoeba histolytica* in their stools immediately thereafter. The patients treated with any dosage for only a single day were not freed of their parasites. Subsequent retreatment of these for the 5-day period apparently cleared them of parasites. Long-term observation was pointless in view of

the probability of re-infection under the conditions obtaining. The treatment caused no side effects. *A. R. D. Adams*

STAM, A. B. & STAM-MIELZINER, S. J. **The Relationship between Diameter and Virulence of the Cysts of** *Entamoeba invadens* **Rodhain.** *Trop. & Geograph. Med.* Amsterdam. 1959, June, v. 11, No. 2, 174–80, 4 figs. Discussion 181.

In view of indications in the literature that the virulence of *Entamoeba histolytica* is in some way correlated with the size of its cysts, the authors carried out experiments to verify this point, with the reptilian amoeba, *E. invadens*, which is morphologically identical with the human parasite and, like the latter, varies in virulence.

Lizards (*Lacerta agilis*, *Agama atricollis* and *A. bibronii*) were infected by mouth with cultures of *E. invadens* containing numerous cysts the measurements of which in different samples varied from 9 μ to 21 μ in diameter. It was found that only samples which contained very large or very small cysts produced acute infections in the lizards. According to the authors, large cysts produce amoebae which do not survive for long in the lumen of the gut, but their invasive power (virulence) is so great that they rapidly penetrate into the intestinal wall. On the other hand, amoebae produced by small cysts, though less virulent, live long enough in the lumen for some of them to be able to invade the tissues. Moreover, these properties of the cysts are also correlated with the surrounding temperature, so that the small cysts of *E. invadens* have a better chance of surviving in the colder waters of temperate zones than the large cysts, while the latter will find favourable conditions in countries with a hot climate. It is thought that the same arguments apply to *E. histolytica*, for it has been shown that the cysts of strains from Indonesia, where acute amoebiasis occurs, are larger than those of Netherlands strains [this *Bulletin*, 1929, v. 26, 870]. The authors, therefore, see no justification for accepting BRUMPT's concept, according to which there are two morphologically indistinguishable species: the virulent *E. histolytica* in hot countries and the non-virulent *E. dispar* elsewhere. *C. A. Hoare*

i. COURT, J. M. & ANDERSON, Charlotte M. **The Pathogenesis of** *Giardia lamblia* **in Children.** *Med. J. Australia.* 1959, Sept. 26, v. 2, No. 13, 436–8. [13 refs.]

ii. ———— & STANTON, Clare. **The Incidence of** *Giardia lamblia* **Infestation of Children in Victoria.** *Ibid.*, 438–40.

i. Investigation of abdominal complaints of a large number of children in Melbourne revealed that 13 of them harboured *Giardia intestinalis*. There was no other abnormal laboratory finding, but 11 of them had chronic or subacute diarrhoea and in 3 of these the diarrhoea was steatorrhoeic. Details of the condition of individual patients and the findings in each are set out. Successful mepacrine treatment of the infection in each case was followed by cessation of the symptoms and a return to normality of the children. A review of the literature shows conflict of view on the pathogenicity of *G. intestinalis*, but where the parasite is found in children with abdominal symptoms its removal, as in these cases, may be followed by their restoration to health.

ii. Following the preceding observations groups of infants (under 12 months of age) and of children, both sick and well, from various sources were examined to determine the incidence of *Giardia intestinalis* infection among them, and its effect. The incidence in 57 infants was about 4% ; that in 91 children over 30% ; and the gross was 21%. The infection in the children usually was symptomless, but in the infants anaemia, failure to thrive, and diarrhoea were associated with it. *A. R. D. Adams*

NAGESHA, C. N. & KUTTY, M. K. **Balantidial Dysentery in Mangalore.** *Indian J. Med. Sci.* 1959, Oct., v. 13, No. 10, 841–2.

"A case of balantidial dysentery is reported.

"The diagnosis was established by microscopic examination of the feces for trophozoites of *Balantidium coli.*

"Successful cultivation of *Balantidium coli* was possible in a medium consisting of one part of inactivated serum, 16 parts of 0·5% salt solution and 0·25 gram of starch."

LEON, L. A. & GUERRERO, F. Coccidiosis hepática. (Consideraciones anatomopatológicas y clínicas.) [**Hepatic Coccidiosis**] *Medicina.* Mexico. 1959, Feb. 10, v. 39, No. 813, 45–50, 4 figs. [10 refs.]

Report of a case from Ecuador, and discussion.

RELAPSING FEVER AND OTHER SPIROCHAETOSES

GALLIARD, H., LAPIERRE, J. & ROUSSET, J. J. Atténuation de l'infection à *Trypanosoma cruzi* chez la souris blanche par différentes souches de *Borrelia.* [**Attenuation of** *Trypanosoma cruzi* **Infection in the White Mouse by Different Strains of Spirochaetes**] *Bull. Soc. Path. Exot.* 1959, May–June, v. 52, No. 3, 272–6, 3 figs.

The antagonistic action of spirochaetes on trypanosome infections is well known and has recently been used in the identification of strains of relapsing fever, since different strains seem to produce different effects [this *Bulletin*, 1958, v. 55, 768 ; 1960, v. 57, 129]. The authors have tested the action of *Spirochaeta duttoni*, *S. crocidurae* and *S. persica*, respectively, on chronic infections of *Trypanosoma cruzi* in white mice. In every case the inoculation of *S. duttoni* or *S. crocidurae* was followed by a reduction in the numbers of trypanosomes and their almost complete disappearance from the circulation, but without curing the infection, as the organisms reappeared after varying intervals. The effect of *S. persica* was not so marked, as although this strain produced a definite reduction in the numbers of *T. cruzi*, the organisms never completely disappeared from the blood. *Edward Hindle*

CALABI, Ornella. **The Presence of Plasma Inhibitors during the Crisis Phenomenon in Experimental Relapsing Fever** (*Borrelia novyi*). *J. Exper. Med.* 1959, Nov. 1, v. 110, No. 5, 811–25, 5 figs. [19 refs.]

"The intensity and duration of *Borrelia novyi* infection in rats depend upon the dose of spirochetes administered. The spirochetemia in response to an inoculum of 1×10^6 spirochetes/kg. characteristically reaches a peak of 4 to 5 million organisms per c.mm. of blood at about 72 hours. Resolution of the primary infection occurs within 48 hours after the peak counts have been observed, with crisis ending at 100 to 120 hours after inoculation.

"Treatment of the acute infection, so standardized, by 10 ml./kg. of crisis plasma intraperitoneally delays the onset of the spirochetemia 76 to 140 hours, and reduces the maximal spirochetal count 10^{-3} to 10^{-6} that of the unmodified controls. This is evidence that inhibitor is present in the plasma at the time of crisis and plays a role in limiting the primary infection and subsequent relapses. The activity of crisis plasma is not destroyed by freezing, or after storage at 4°C. for 4 days. Fractions I + II + III and IV + V + VI from crisis plasma, obtained by method 10 of Cohn *et al.*, were also effective in suppressing the acute spirochetemia, but differed in duration and effectiveness. The first of these was about as potent as the undiluted whole plasma, and the second about as potent as plasma diluted 1:4."

YAWS AND OTHER TREPONEMATOSES

TURNER, L. H. **Notes on the Treponematoses with an Illustrated Account of Yaws.** *Bull. Inst. Med. Res. Fed. Malaya.* 1959, No. 9, pp. xxiii + 278, numerous illustrations. [153 refs.]

The author has attempted a reappraisal of the treponematoses in the light of modern experience. In the past there have been monumental works on syphilis and an excellent illustrated guide to yaws [HACKETT, this *Bulletin*, 1958, v. 55, 656]. This work differs in that although it presents a detailed account of yaws as seen in Malaya, it reviews the changing scene of the treponematoses since the widespread introduction of long-acting penicillin and the availability of modern methods of microbiological investigation.

Chapter 1 is devoted to a consideration of the major common features of sporadic (venereal) syphilis, endemic (non-venereal) syphilis, yaws and pinta. Although there are no morphological or serological means available for differentiating the treponemes pathogenic in man, their different behaviour in man and to some extent in animals justifies their separate consideration, whether or not the treponemes are considered to be different species or different strains of one (or more) species. Certain zones of endemic syphilis seem to have arisen from sporadic syphilis. The major epidemiological features are discussed and tabulated in chapter 2 and the clinical features and histopathology in chapter 3. Chapters 4, 5 and 6 are devoted to a consideration of the course of infection as shown by the varying clinical features of the incubation period, the 3 stages of clinical activity and the latent stages, with

the corresponding changes in serology. The value and limitations of various serological tests are fully illustrated and lead naturally to concepts of the underlying mechanisms affecting the natural history of the infections.

Each of the treponematoses is then described and yaws is illustrated by numerous excellent reproductions. Too often cracked feet are accepted as evidence of yaws. The differential diagnosis of hyperkeratotic palmar and plantar yaws is fully discussed and illustrated. The treatment and control of yaws are discussed in detail.

Although the treponematoses are receding infections, consequent upon improved hygiene and penicillin, there is as yet no place for complacency. Resistance to penicillin has not yet been demonstrated by these treponemes but allergic reactions to penicillin limit its use slightly, and other antibiotics, although effective, may obscure other concomitant venereal infections.

The article is well documented and there are numerous references to the literature. Although only claimed to be "Notes" the author has produced a valuable monograph. *Frederick J. Wright*

KRANENDONK, O. J. M. **Serological and Epidemiological Aspects in Yaws Control. Report on a Mass Treatment Campaign against Yaws in Netherlands New Guinea.** [Thesis.] 103 pp., 12 figs. [Numerous refs.] 1958. Amsterdam: University, Laboratorium voor de Gezondheidsleer, Mauritskade 57, Holland.

This very interesting thesis starts with an account of the country and its people. The population, about 700,000, live in small and scattered villages so that the average population density is approximately 2 to the square kilometre (5 per square mile). Communicable diseases predominate and the stable diet is sago in the lowlands and tubers in the mountains. The standard of living is poor and in some areas is very primitive but general improvement is taking place. Anti-yaws work was interrupted by the war and since 1947 has rapidly increased with the use of arsenical preparations until 1954 when penicillin came into general use. The increased number of injections noted is probably due to increased medical activity so that, in 1953, 150,000 injections were given to make a total of about 800,000 in the 8 years ending 1955. The average prevalence of clinically active yaws found at mass treatment surveys, 1955–1957, was only 5%. The failure of treatment before penicillin was introduced was attributed to the small number of arsenical injections given, the treatment of clinical cases only, incomplete coverage of the population and unchanged environment. When penicillin was introduced, total mass treatment [this *Bulletin*, 1957, v. 54, 689] with a single injection of PAM 1·2 mega units (4 ml.) was given for adult active yaws and less for children and latent cases. Every effort was made to see the whole population.

The organization of the campaign that started in 1955 is described. UNICEF provided PAM, syringes, etc. Careful records were kept, a start being made with household data. On an average 3·9 hours were spent in travelling and 2·9 hours in examinations and treatment each day. The remaining time was spent in preparations, health education, etc. Over half the travelling was done on foot and much of the rest by boat.

On the average 96·5% of the population in the administered areas were examined. From the tables it is seen that the total of clinically active yaws

found was 5% and infectious yaws 2·9%, which is remarkably high. The proportion of infectious yaws : hyperkeratosis : late active yaws was as 1 : 0·5 : 0·3. Active yaws was most prevalent in children. Tables show the distribution of various yaws lesions by sex and age. No serious reactions to penicillin were observed. The average dose of PAM per person treated (total mass treatment) was 2·1 ml. At resurveys new cases of yaws were most frequent in persons who had been missed at the initial treatment survey and in some areas infectious cases had come from adjacent untreated areas. Many of the new cases found after the first resurvey were re-infections. One indirect result of the yaws campaign is said to be the increased interest of all concerned, from general population to administrators, in better health.

Serological testing is recommended to measure the latent infections, especially where previous treatment had suppressed active yaws, and also to measure the effect of the mass treatment.

The Chediak test with cardiolipin VDRL antigen on dried blood drops was used, although it was less sensitive than the standard VDRL slide test especially in lower dilutions. The serological findings in cases of active yaws and in persons without active yaws are discussed.

Serological findings at surveys are shown in tables and figures. Sero-reactor prevalence varied with clinical prevalence, but previous treatment had often reduced the clinical prevalence so that the relation between the two prevalences was not constant (the proportion of sero-reactors to clinically active cases being 10:1 to 30:1). Where there had been much previous treatment for a long time, sero-reactor prevalence had also been greatly reduced, and probably the relapse rate is also low. After mass treatment titres fell. After 18 months 50–80% sero-reversal was found in some populations where there had been considerable previous treatment; where there had been little previous treatment and titres were consequently higher, reduction in titres and not reversal was more usual.

The clinical and serological findings in an isolated population of about 20,000, in an inaccessible flood-forest coastal area where there had been no previous treatment, are discussed. There were 11·7% of clinically active cases and 85% sero-reactors.

The clinical findings were as follows:

	Males	*Females*	*Total*
Initial lesions	0·2	0·1	0·19
Multiple papillomata	6·9	6·7	6·81
Plantar papillomata	2·1	1·2	1·63
Hyperkeratosis	1·1	0·5	0·81
Late yaws	2·0	2·6	2·29
Total active:	12·3	11·1	11·73
Population examined:	9,930	9,287	19,217

Hyperkeratoses and late lesions were never seen in the same patient at the same time. The prevalence of the former was remarkably low. Upon the findings and certain assumptions where data were not available, contact rates and average duration of multiple papillomata (between 1·7 and 3·5 years) are

calculated. Other calculations based upon the Reed-Frost model suggest that if only a few infectious cases are left after treatment (with PAM) the rate of spread of yaws is slow. The number of susceptibles and the contact rate play obviously important parts in this spread. These factors are discussed in relation to the extent of mass treatment needed in areas where previous treatment has greatly reduced the prevalence of active yaws.

The conclusion is reached that "it would appear that with good organization and adequate treatment, complete eradication of the disease may be achieved in about five years" but continued surveillance is necessary to deal with relapses, missed cases and the introduction of infectious cases.

[This is an interesting and valuable study of good field work. It should be carefully studied by all in charge of yaws eradication campaigns. Clinical and serological studies in other campaigns should be extended where possible.]

C. J. Hackett

LEPROSY

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

COHN, E. Die lepra als soziales Problem in Lateinamerika. [**Leprosy as a Social Problem in Latin America**] *Ztschr. f. ärztl. Fortbildung.* 1959, May 15, v. 53, No. 10, 584–8, 4 figs. [24 refs.]

HANKS, J. H. **Enumeration of** *Mycobacterium leprae* **for the Standardization of Lepromin.** *Internat. J. Leprosy.* Wash. 1959, Apr.–June, v. 27, No. 2, 134–40.

In this method 0·02 ml. of chloroform is placed beneath 0·2 ml. of lepromin and shaken for 3 minutes; this treatment causes the globi to disintegrate and the bacilli to become evenly dispersed. 20 ml. of 1% serum in 0·5% phenol water is then added and the droplets of 0·00022 ml. are placed with a loop 0·7 mm. in diameter on to a glass slide. After drying and fixing in formalin vapour the films are stained and the bacilli counted.

The method has confirmed that the number of bacilli per gm. of lepromatous tissue varies over a 10-fold range. The continued need for pooling is therefore emphasized, not only for ensuring uniformity in the concentration of the bacilli but also in the amount of autoclaved human tissue present; this is important because the tissue may be one of the reactive components in the Mitsuda test.

S. R. M. Bushby

CONTRERAS, F., GUILLÉN, J., TERENCIO, J. & TARABINI, G. Tratamiento de la lepra con "Dipasic". [**Treatment of Leprosy with Dipasic**] *Rev. "Fontilles".* Alicante. 1959, Jan.–June, v. 4, No. 7, 545–51.

The authors report the results of treatment of 28 strongly positive lepromatous cases of leprosy with Dipasic (a combination of PAS and isonazid).

Short histories are given of the patients and their progress under treatment. In general the tolerance of this combination of drugs was excellent under the dosage used, which was 5 mgm. daily for every 10 kgm. of the patient's weight, sometimes increasing to 900 mgm. with careful control.

In 11 patients there was definite clinical improvement, but bacteriological improvement was less obvious. Patients who had become bacteriologically negative on sulphones maintained their good clinical and bacteriological condition when kept on Dipasic. The authors consider that Dipasic could be effectively used before sulphone treatment is begun, in combination with sulphones, and also in certain patients who are refractory to sulphones.

Ernest Muir

MONTESTRUC, E. Le "para-amino-salicylate d'isonicotyl hydrazide" dans le traitement de la lèpre. [**Para-amino-salicylate of Isoniazid in the Treatment of Leprosy**] *Bull. Soc. Path. Exot.* 1959, May–June, v. 52, No. 3, 283–7.

The experience of the author with this combination of PAS and INH (Pasiniazid) in the treatment of leprosy goes back to 1956 when he reported that the results in the lepromatous form were not encouraging, but that better results were obtained in the tuberculoid type [this *Bulletin*, 1956, v. 53, 1125]. However since then he has tried alternating this treatment with DDS, giving 100 to 200 mgm. DDS daily for 2 months and then substituting 400 mgm. daily of Pasiniazid for 15 days. Out of 16 lepromatous patients 11 became bacteriologically negative during the first year. The author considers that though the improvement in lepromatous leprosy may not be much better than with DDS alone, yet the improvement in the tuberculoid type is speeded up by intercalating Pasiniazid. He found that Pasiniazid, while it did not diminish bacilli, prevented their multiplication when DDS had to be stopped because of reactions, and tended to suppress or diminish reactions.

Ernest Muir

LANGUILLON, J. L'asiaticoside dans le traitement des ulcères chez les lépreux. [**Asiaticoside in the Treatment of Leprous Ulcers**] *Bull. Soc. Path. Exot.* 1959, May–June, v. 52, No. 3, 249–51, 1 fig. on pl.

After mentioning various other remedies that have been used in leprous perforating and other ulcers, the author describes their treatment with Asiaticoside, the active principle of the plant *Centella asiaticoe*. This substance in the form of crystals is suspended in normal saline, and 25 mgm. is injected intramuscularly thrice a week. The treatment of 10 patients is described, who received from 9 to 27 injections. The ulcers were first rendered sterile by use of penicillin-trypsin. With 1 exception the ulcers all healed in periods of 3 to 9 weeks. Most delay was caused by the presence of underlying osteitis. The action of this substance is not on the lepra bacilli, but by virtue of its cicatricial property.

Ernest Muir

HELMINTHIASIS

In this section abstracts are arranged as far as possible in the following order:—TREMATODES (*schistosomes, other flukes*); CESTODES (*Diphyllobothrium, Taenia, Echinococcus, other cestodes*); NEMATODES (*Hookworms, Ascaris, Filarial worms, Dracunculus, etc., Trichuris, Enterobius, Trichinella, etc.*).

BIOCCA, E. **Studies of Intestinal Helminthiasis in Jewish Communities in Iran.** (With an appendix on **Observations concerning the Reptiles, Rodents and Arthropods present in certain Jewish Quarters in Iran.**) *Parassitologia.* Rome. 1959, Apr., v. 1, No. 1, 21–67, 1 fig. [21 refs.]

This paper reports the findings of a study on the incidence, epidemiology and treatment of intestinal helminths among Jews in Iran. A single specimen of stool from each person was concentrated in saturated NaCl. The communities studied in Teheran, Isphahan and 4 provincial areas are described in detail and a shocking state of environmental hygiene is revealed. In Teheran 35% of children and 44·2% of adults harboured helminths. Among adults *Ascaris, Hymenolepis, Trichostrongylus* and *Taenia* occurred in that order of incidence. In kindergarten pupils *H. nana* was more common than *A. lumbricoides*, and a single scotch tape examination showed 63% infected with *Enterobius vermicularis* though four examinations in a series of 100 children increased the incidence to 90%. In Isfahan 99·3% of 450 persons were positive for helminths, *A. lumbricoides* being the most common and *Trichostrongylus* present in 46·7%. *E. vermicularis* infected 59% of kindergarten pupils. In the provincial investigations smaller numbers were studied and incidences of infection ranged from 42% to 100% in the four areas, the same helminth species being present.

The epidemiological studies gave interesting results. *A. lumbricoides* incidence was correlated to some extent with the hygienic state of wells, but more significant was the correlation with faeces disposal. Large deep pits infrequently emptied were associated with a lower *A. lumbricoides* incidence than superficial pits frequently emptied. Kindergarten children, because they were taught hygiene and did not play in the streets, showed a much lower incidence than the general level. *Hymenolepis nana* was the second most common parasite, probably because direct transmission is usual. Rats and mice did not appear to be important epidemiologically. *Trichostrongylus* sp. (later shown to be *T. orientalis*) was unexpectedly common, especially among people keeping donkeys and goats though a direct correlation did not always exist. Butchers, however, sell animal intestines containing faeces harbouring ova, which were emptied in the home. *Trichuris trichiura* was not common but *Taenia saginata* was probably widespread in the community owing to the eating of undercooked meat. *Ancylostoma* was not found.

Various anthelmintics were tested, first on animals and then on man. Among the drugs tested on dogs piperazine and enteric-coated papain capsules showed most promise; hexylresorcinol and arecoline were effective against *Uncinaria* but not ascariasis. Oxytetracycline was partially effective. Ascariasis was the main problem in man and therefore piperazine and papain were tested in a small series of cases. The dosage and technique of administration are described. Piperazine proved satisfactory and it is recommended that papain should be added to avoid spasm and intestinal obstruction by worms.

This treatment also significantly reduced *Enterobius* incidence, but was less effective against *Hymenolepis* and *Trichostrongylus* than hexylresorcinol and tetrachlorethylene respectively.

During this survey observations made on insect vectors, reptiles, rodents and poisonous arthropods, are reported in an appendix. It is recommended that insect vectors, snakes and scorpions, which are a serious menace to health, should also be attacked in any public health campaign. *T. H. Davey*

LARIVIERE, M., CORREA, P. & LAUROY, J. A propos de deux cas de cervicite bilharzienne. [**Two Cases of Schistosomal Cervicitis**] *Bull. Soc. Méd. Afrique Noire Lanque Française.* Dakar. 1959, v. 4, No. 3, 313–16.

BADR, M., ZAHER, M. & FAWZY, R. **Further Experience with Bilharzial Bladder Neck Obstruction.** *J. Egyptian Med. Ass.* 1958, v. 41, Nos. 11/12, 624–9, 3 figs. on 2 pls.

The second author, from Cairo, published an article on this subject in 1956 (*J. Egypt. Med. Ass.*, 1956, v. 39, 10) and the present authors now re-assess their findings after having experience with 84 other cases. They consider that the obstruction is due to the results of the intractable cystitis combined with prostatism. They do not find that urethral stricture and prostatic hypertrophy are responsible; in fact, the prostate is commonly smaller, harder and higher in position. X-ray examinations confirm that the bladder base (which may even be calcified in the later stages) is considerably elevated.

The rigidity and elevation of the base of the bladder make cystoscopy more difficult and the authors describe their technique. They divide the disease into 3 stages. In Stage 1 the posterior lip of the bladder neck is lengthened and shelving and still opens up sluggishly on straining to pass urine. Stage 2 is when the posterior lip is more raised and harder so that it no longer moves on straining. The bladder wall is now obviously hypertrophic. In the third stage the neck is tightly contracted by advanced fibrosis and the rest of the bladder wall may still be ridged by hypertrophic bands or have become atrophic and dilated until it becomes only parchment thick. Sometimes the wall is so thick and rigid that the bladder only holds some 50 cc. of fluid.

Operative findings confirm the changes shown by cystoscopy, and show that the scarred trigone is smaller than normal as well as being fixed and very hard. Mucosal ulcers, calculi and papillomata may be present in addition to the cystitis.

Treatment in the first stage (44 cases in this series) is by repeated urethral dilatation with the added manoeuvre of "ironing" the posterior lip of the neck by pressing back gently but firmly as the dilator is slowly withdrawn. If, for any reason, cystotomy is necessary then digital ironing can be done from above and simple linear sphincterotomy performed on either side of the mid line. In the second stage (28 cases) some form of wedge resection of the bladder neck is done, either endoscopically or by open operation, when the thickened interureteric bar may be divided by simple incision. If there is sacculation of the bladder base due to fibrosis this should also be dealt with by division of the intervening bands. Stage 3 (12 cases) needs to be treated by some form of trigonectomy, but the best method of dealing with these difficult

cases has not yet been settled. After the trigone has been excised, the lateral prostatic lobes can be separated digitally to dilate the posterior urethra. A suprapubic tube is left in after this operation.

The improvement claimed in the patients in each of the 3 groups is given as 45%, 68% and 83% respectively. *J. R. Rose*

BRASS, K. La Schistosomiasis mansoni en el material autópsico del Hospital Central de Valencia, Venezuela. [*Schistosoma mansoni* **Infection as seen in Autopsy Material in the Central Hospital, Valencia, Venezuela**] *Archivos Venezolanos de Patol. Trop. y Parasit. Méd.* 1959, July, v. 3, No. 1, 272–89.

The English summary appended to the paper is as follows:—

"By the microscopic examination of at least one small piece of liver tissue with macroscopic manifestation of Bilharziasis it was shown that the frequency of the disease in the population of the State of Carabobo, Venezuela, sixteen years old and more, is 9·65%.

"On the classification of the material according to domicile it was shown that 31·7% of cases came from the Lake of Valencia including the towns of Mariara, San Joaquin, Guacara, Los Guayos, El Roble, Central Tacarigua, Güigüe, Belen and Manaure. In a lesser percentage was a group from Valencia, Tocuyito and the town on the Valencia-Puerto Cabello Highway. All these localities form the area of human Bilharziasis of the State of Carabobo.

"It was surprising to find no cases from the mountain region towns. Valencia itself showed a percentage of infection of 5·7%. This is explained by the fact that many of these cases were infected out of the city. For this and other reasons this 5·76% does not reflect exactly a danger of infection within the urban limits of Valencia.

"These results are in principle exactly like those of *Jove* and *Marszewski*. However our results are easily superior to those of these authors due to the superiority of our method compared with coprological examinations."

ROWAN, W. B. **Seasonal Effect of Heavy Rains on the Population Density of** *Australorbis glabratus* **in a Puerto Rican Watershed.** *Amer. J. Trop. Med. & Hyg.* 1959, Sept., v. 8, No. 5, 570–74, 2 figs.

A survey of *Australorbis glabratus* populations in the drainage area of the Guaynabo River, Puerto Rico, was carried out over 1 wet and 2 dry seasons, with special attention paid to the effects of seasonal flooding. During the 17-month observation period 22 floods of varying intensity were recorded. Such flooding had a marked effect on the snail population; 5 or 6 heavier floods decimated the snail population of certain tributaries. The snail density recovered rapidly in spite of repeated minor floods. Thus, the snail population of the main streams fluctuated markedly during the wet season and the population density increased consistently during the drier months. In the upland breeding areas the numbers of snails remained fairly stable from one season to the next. It was considered that the rapid repopulation of the streams was probably due to the presence of egg masses that remained attached to the marginal vegetation, but that the upland areas may well be an important contributory factor in supplying small snails or eggs to the downstream reaches.

It is concluded that on the basis of the data obtained, artificial flooding of streams would do little to control the population of *A. glabratus*.

O. D. Standen

COLOMBO BARRETO, A. **Natural and Experimental Desiccation of** *Australorbis glabratus* **(Mollusca, Planorbidae) of the City of Salvador, Bahia, Brasil.** *Bol. Fundação Gonçalo Moniz.* Bahia. 1958, Dec., No. 13, 13–24, 2 graphs & 4 figs. on 4 pls. [14 refs.]

This paper reports the results of an investigation into the ability of two forms of the Brazilian snail intermediate host of *Schistosoma mansoni*, *Australorbis glabratus*, to withstand desiccation both in nature and under laboratory conditions. The observations in natural habitats were inconclusive because of unseasonable rain showers, but the laboratory experiments confirmed the finding of other investigators that those snails from habitats which normally dry out during the summer are much more resistant to desiccation than are those from habitats which retain water throughout the year. It is shown that this ability to withstand drying is definitely a characteristic of the habitat rather than of the "form" of the snail: thus the form *bahiensis* of *A. glabratus* from a permanent lake was shown to die quickly when exposed to desiccation in the laboratory, while the same form from a temporary irrigation ditch will survive just as well as the form *olivaceus* from a similar temporary habitat.

C. A. Wright

KLOETZEL, K. A reação de precipitação periovular na esquistossomose. II. Correlação aos dados clínicos. [**The Circumoval Precipitation Reaction in Schistosomiasis. II. Correlation with Clinical Findings**] *Rev. Inst. Med. Trop. São Paulo.* 1959, July–Aug., v. 1, No. 2, 129–37, 2 figs. English summary.

In this report [for Part I see *Rev. Brasil. Biol.*, 1959, v. 19, 75] findings are given after experiments in animals and in man. Mice were infected with cercariae of *Schistosoma mansoni*. The responsible antibodies appear early, not later than the 50th day after infection, while the faeces become positive on the 46th day.

In 30 mice divided into 2 groups according to whether the duration of infection was less or more than 90 days the results of the test showed no difference, but in 24 animals examined after autopsy the reaction seemed greater with severe infections, thus suggesting that it is a quantitative test. In man the titre fell rapidly after effective treatment, but out of 38 patients treated with antimonials 3 had persistently negative faeces and a positive precipitation test; of sera from 55 patients not suffering from schistosomiasis, whose ages ranged from 2 months to 65 years, only 1 was positive; in 80 patients not under treatment whose ages ranged from 11 to 53 years the titre was greatest in the severe infections. 3 false negatives were found. Among the many interesting cases reported was one with negative faeces but intradermal test + + +, and precipitation index 15·1; one case of possible spontaneous cure where only dead ova were found is also mentioned.

The author concludes (1) that the test is mostly quantitative; (2) that an index above 10 is a sign that active oviposition is occurring, even though faeces

and rectal biopsy may be negative; (3) that the most suitable field for the test is in the early control of treatment; (4) that enlargement of the spleen seemed to have no effect on the index, and (5) that the index falls after effective treatment. *W. K. Dunscombe*

RODRIGUEZ-MOLINA, R., LICHTENBERG, F., OLIVER-GONZALEZ, J. & RIVERA DE SALA, Amina. **Studies on Immunity to** *Schistosoma mansoni*. **II. The Circumoval Precipitin Reaction to** *S. mansoni* **in Mice treated with Stibophen.** *Amer. J. Trop. Med. & Hyg.* 1959, Sept., v. 8, No. 5, 565–9, 2 figs.

20 mice were infected with *Schistosoma mansoni*. After the 70th day, 15 of these were treated with stibophen intramuscularly 10·2 mgm./kgm. 5 days a week up to 280 days. The other 5 mice were left as controls. At intervals the mice were killed, the liver and intestine were examined microscopically for eggs, and the sera were tested for circumoval precipitins.

The untreated mice continued to contain eggs for 210 days after exposure (last mouse killed) and the circumoval test was always positive. The treated mice were positive to a diminishing extent to the circumoval test up to the 210th day of treatment, 280th day after exposure, but after that they were negative. Living eggs were found in the liver until the 180th day after exposure, and dead eggs were found until the 220th day. It is suggested that when the circumoval test becomes negative in patients, this indicates the extermination of the infection. [This conclusion is probably correct, but the number of observations on which it is based is small.]

[See also this *Bulletin*, 1959, v. 56, 738.] *F. Hawking*

SENTERFIT, L. B. **Immobilization of the Miracidia of** *Schistosoma mansoni* **by Immune Sera. I. The Nature of the Reaction as Studied in Hamster Sera.** *Amer. J. Hyg.* 1958, Sept., v. 68, No. 2, 140–47, 3 figs. **II. The Occurrence of the Antibody during the Course of Schistosomiasis.** *Ibid.*, 148–155, 4 figs. [11 refs.]

I. The author described in 1953 [see this *Bulletin*, 1954, v. 51, 401] the immobilization of the miracidia of *Schistosoma mansoni* by the sera of infected animals, and it is shown here that this reaction is due to an antibody; the immobilizing activity is produced in the sera of hamsters by infection with antigen-adjuvant emulsions prepared from adult worms, eggs, or cercariae of *S. mansoni*, and this property is lost in absorption of the sera with powdered adult worms, eggs or cercariae.

II. The reaction is compared with other serological reactions. The miracidial immobilization reaction and the cercarial agglutination and circumoval precipitate reactions become positive at the same time in experimentally infected monkeys. In human infections, the titres of the miracidial immobilization and the cercarial agglutination titres are related. No relation was shown between the immobilization reaction and the circumoval precipitate and the circumcercarial precipitate reaction.

To determine whether immobilizing antibody is produced in the absence of eggs, unisexual infections of each sex were produced in hamsters, and antibodies were produced to the miracidia and the cercariae but not to the eggs as evidenced by the circumoval precipitate reactions.

In acute infections in monkeys and in man, the immobilizing antibody was at high level, and in chronic infections it was low or absent.

Serum from human infections with *Trichinella spiralis* (proved by muscle biopsy) contained miracidial antibody, but none was found in infections with *Trichuris trichiura* or hookworm, nor in persons with positive skin tests with antigen prepared from *Paragonimus westermani*.

Further study of this antibody should be made to determine its relation to the resistance of the host to infection, since the reaction can be titrated accurately. *W. E. Kershaw*

PIFANO C., F. & RON PEDRIQUE, M. La cercaria-reacción de Vogel y Minning en el diagnóstico de la Schistosomiasis mansoni. [**The Cercaria Reaction in the Diagnosis of** *Schistosoma mansoni* **Infections**] *Archivos Venezolanos de Patol. Trop. y Parasit. Méd.* 1959, July, v. 3, No. 1, 185–92

The English summary appended to the paper is as follows:—

"The authors give the results of their research on the behaviour of the Vogel and Minning Test in human cases of Schistosomiasis mansoni studied in Venezuela. In five cases observed during the invasion phase on whom tests were made together with intradermal reaction with Bilharzina and the coprological examinations from the beginning of the infecting bath, the Test gave positive results from the fourth week on, preceding the positive results of the intradermal tests and the appearance of egg in the feces. In 1,380 cases of Schistosomiasis found positive of which 1,315 were diagnosed by coprological examinations and 65 by rectoscopic biopsy, Vogel and Minning Test was positive in 78% of cases.

"These results allow the recommendation that the Test be included among the routine methods used at present for the diagnosis of Schistosomiasis."

LEWERT, R. M., LEE, C. L., MANDLOWITZ, S. & DUSANIC, D. **Inhibition of the Collagenase-Like Enzymes of Cercariae of** *Schistosoma mansoni* **by Serums and Serum Fractions.** *J. Infect. Dis.* 1959, Sept.–Oct., v. 105, No. 2, 180–87, 1 fig. [23 refs.]

The cercariae of *Schistosoma mansoni* produce enzymes which hydrolyse collagen and various other substances, thus facilitating invasion by the cercariae [this *Bulletin*, 1957, v. 54, 451 ; 1958, v. 55, 55]. These enzymes can be studied by the amount of dye which they release from an azo-dye-hide-powder collagen. The serum of infected persons contains a substance which inactivates the cercarial enzymes. The inhibitor is relatively stable to heat and storage. It behaves like serum alpha globulin. It is not identical with the substances in serum which inhibit trypsin and hyaluronidase respectively. It is also distinct from the cercaricidal factor of normal and immune serum. Apparently it is not related to serum mucoprotein or glycoprotein but there may be a relationship to alpha lipoprotein. Probably it is not an antibody, although this possibility cannot be excluded. It is not increased in the serum of mice or other animals which have been exposed to infection. Considerable amounts of inhibitor are present in normal monkeys but nevertheless the monkeys can easily be infected by cercariae.

Although the observed facts are not conclusive in proving any single

hypothesis the authors consider that probably the inhibitor is a non-specific substance occurring normally in the serum at a low level; in man the serum level is raised as a result of the tissue damage which occurs during an active infection.

[This paper should be studied in the original by those interested.]

F. Hawking

STANDEN, O. D. & FULLER, K. A. **Ultra-Violet Irradiation of the Cercariae of** *Schistosoma mansoni*. **Inhibition of Development to the Adult Stage.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1959, Sept., v. 53, No. 5, 372–9, 1 fig. [14 refs.]

The use of ultra-violet radiation for the destruction of bacteria has long been recognized and a number of papers have been published concerning its effect on helminth ova [this *Bulletin*, 1941, v. 38, 526 and 1944, v. 41, 596] but, apparently, only one author, STOWENS [*ibid*., 1943, v. 40, 403], has considered its action on the active stages of helminths, and no work has been done on the control of schistosomiasis by this means.

The authors of the present paper carried out a long series of carefully controlled tests in which large numbers of mice were exposed to known numbers of *Schistosoma mansoni* cercariae which had been exposed previously to various doses of ultra-violet radiation. When commenting on the results obtained the authors state that: "From the foregoing experimental data it is obvious that brief exposure of the cercariae of *S. mansoni* to ultra-violet light, mostly in the region of 2537 Å, has a profound effect upon the ability of these infective organisms to complete development to the adult stage. The fact that exposure to irradiation for periods as short as 4–8 seconds, within the limits of distance from source imposed by a standard water sterilizer, produced total inhibition of development offers a means whereby the safety of domestic water supplies in areas where schistosomiasis is endemic may be ensured. . . . While the practical application of such a technique can only be proved in use, the physical effect of ultra-violet irradiation upon schistosome cercariae is of great biological interest. Examination of the water remaining subsequent to the infection of mice showed no distinction between the controls and the irradiated cercariae. In both instances only the shed tails of the cercariae were recovered and this suggested that the skin penetrative powers of the irradiated cercariae were not impaired. Current investigation of the point of failures of the irradiated cercariae in the mouse suggests that penetration of the skin proceeds normally and that the irradiated cercariae enter the lymphatic system". [These preliminary findings are very promising, and the results of the further investigations, referred to by the authors at the close of the present paper, will be awaited with interest.]

R. M. Gordon

KOMIYA, Y., KOJIMA, K. & YASURAOKA, K. **Study on the Food Habit of** *Oncomelania*. **I. A New Simple Technic for studying the Food Habit of** *Oncomelania* **and its Mouth Opening Reaction.** *Japanese J. Med. Sci. & Biol.* 1958, Oct., v. 11, No. 5, 329–37, 7 figs.

Observations on the mouth opening movements of *Oncomelania* spp. were made by direct observation through the bottom of an inverted Petri dish in which the snails were moving on the inner surface. The closed mouth is

seen as a longitudinal slit which expands to an ovoid shape on opening, the radula is exserted and rapidly withdrawn after which the mouth closes to its original slit form. Such movements were performed whether food was available or not but the presence of food increased the mouth-opening frequency. Mouth movements were more frequent at 19·5°C. than at 24°C. or 29°C.; frequency was much the same between *p*H 4·0 and 8·5. Reduction in the volume of the water film surrounding the body had a marked effect on mouth movements. When the film was limited to proboscis and tentacles movement became sluggish and the snail withdrew into the shell. The rapid rate of mouth movements in starved snails remained stable for 15–20 minutes but decreased thereafter as feeding continued [see also this *Bulletin*, 1952, v. 49, 1058; 1956, v. 53, 1353]. *O. D. Standen*

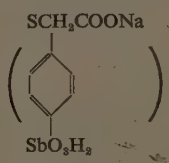
KOMIYA, Y. & HASHIMOTO, I. **The Survival of *Oncomelania nosophora*, the Vector Snail of *Schistosoma japonicum* under the Dried Condition and their Water Loss.** *Japanese J. Med. Sci. & Biol.* 1958, Oct., v. 11, No. 5, 339–46, 7 figs.

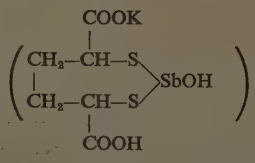
Oncomelania nosophora, graded into 3 sizes, adult, medium and young, were dried on filter paper and maintained at room temperature for 120–130 days. The two larger grades were divided according to sex and all were weighed at the beginning of the observation period. Of the 300–500 snails in each group, random samples of 20–40 snails were taken and weighed and examined each tenth day. Water loss and mortality rate were noted. Summer temperature was 21°C. (mean) and winter temperature 13°C. (mean). Water loss was most rapid up to the 30th day and decreased thereafter; mortality rates were low up to 40 days but then rapidly increased. 100% mortality was observed at 60 days with the youngest snails and at 80–100 days with the adults. The critical water loss appeared to be about 40% of fluid contained in body and shell. Mortality rates were higher at summer temperatures and males appeared to be less resistant to desiccation than were females. *O. D. Standen*

CHU, Chiao-Chen, TAO, Zheng-Qin & TING, Kuang-Sheng. [**Studies on Anti-schistosomal Drugs, XX. Intensive Treatment with Sb-11, Sb-5 and its Salts**] *Acta Pharmaceutica Sinica.* 1959, Oct., v. 7, No. 7, 270–76. [In Chinese.]

The English summary appended to the paper is as follows:—

"In the 14-day-course treatment of schistosomiasis japonica in mice and in rabbits, intravenous injections

of Sb–11 

and Sb–5 

exhibited a

higher therapeutic activity than tartar emetic. The present study compared tartar emetic, Sb–11, Sb–5 and 13 salts of the latter compound in the intensive treatment.

"Infected rabbits and dogs received intravenously Sb–5 b.i.d. for 3 or 7

days. Its toxicity was less than that of tartar emetic, as evidenced by the tolerant doses, electrocardiogram and the liver function (sulfobromophthalein retention) test. Regarding the therapeutic potency Sb–5 is slightly better than tartar emetic.

"Sb–126, a monosodium salt of Sb–5, exhibited a similar toxicity and therapeutic effect. But Sb–126 is soluble in saline, more stable and thus more convenient to administer.

"Sb–11 showed no promising result in the intensive (3- or 7-day-course) treatment of schistosome-infected rabbits and dogs."

[See this *Bulletin*, 1958, v. 55, 787.]

HUNTER, G. W., Jr. **"Swimmer's Itch" in Colorado.** Reprinted from *Ass. Southeastern Biol. Bull.* 1959, v. 6, No. 2, 26.

"Reports received in the summer of 1957 suggested an outbreak the previous year of schistosome dermatitis among bathers at an elevation of nearly 9,000 feet. Investigations in 1957 revealed the presence of two families of mallard ducks. An examination of snails yielded brevifurcate cercariae from seven specimens of *Physa propinqua* Tryon. These parasites were identified as *Trichobilharzia physellae* (Talbot 1936), a bird schistosome found in mallard ducks. Exposure of six human volunteers yielded minimal responses in four persons and a hypersensitive reaction in one, thus indicating that the cercariae penetrated the skin of five of the six individuals.

"This is believed to be the first record of schistosome dermatitis from Colorado."

WYKOFF, D. E. **Studies on *Clonorchis sinensis*. II. Development of an Antigen for Complement Fixation and Studies on the Antibody Response in Infected Rabbits.** *Exper. Parasit.* New York. 1959, Feb., v. 8, No. 1, 51–7. [12 refs.]

The preparation of potent antigen from *Clonorchis sinensis* is difficult. RITCHIE and KING [this *Bulletin*, 1955, v. 52, 388] detected no specific reactions in saline extracts, and CHUNG *et al.* [*ibid.*, 1956, v. 53, 76] found that such extracts could be used in intradermal tests but would not give complement-fixation reactions.

A method was used to prepare antigen from adult *C. sinensis* similar to that used by CHAFFEE *et al.* [*ibid.*, 1955, v. 52, 173; 1957, v. 54, 548] in infections with schistosomes and *Trypanosoma cruzi*. Dehydrated worms were treated with anhydrous ether at −18°C., before extraction with buffered saline. This preliminary ether extraction eliminated anticomplementary activity and reduced cross reactions, without affecting specific sensitivity to homologous serum. The antigen was used successfully in eliciting specific responses in experimental infections in rabbits.

[For Part I see this *Bulletin*, 1958, v. 55, 554.] *W. E. Kershaw*

ALTMANN, G. & BUBIS, J. J. **A Case of Multiple Infection with *Taenia saginata*.** *Israel Med. J.* 1959, Jan.–Feb., v. 18, Nos. 1/2, 35.

A woman of 36 in a village in Israel died of cardiac failure after a few days in hospital. Eggs of *Taenia* were found in the faeces during life, and at

autopsy 16 scolices and strobilae of *Taenia saginata* were found in the intestine. It has been claimed that immunity accounts for the more usual phenomenon of single infection by *T. saginata*. In the present case serum globulin was only 1·8 gm.% and the authors suggest that this might possibly explain the absence of such an immune reaction.

Other cases are quoted from the literature of multiple infection by *T. saginata* [this *Bulletin*, 1925, v. 22, 876; 1937, v. 34, 868].

H. J. O'D. Burke-Gaffney

SCHILLER, E. L. **Experimental Studies on Morphological Variation in the Cestode Genus *Hymenolepis*. III. X-Irradiation as a Mechanism for facilitating Analyses in *H. nana*.** *Exper. Parasit.* New York. 1959, Oct., v. 8, No. 5, 427–70, 29 figs. on 8 pls. & 6 text figs. [45 refs.]

MUJICA S., G. La equinococosis en el material autópsico de Valencia, Venezuela. **[Echinococcal Disease as seen in Autopsy Material in Valencia, Venezuela]** *Archivos Venezolanos de Patol. Trop. y Parasit. Méd.* 1959, July, v. 3, No. 1, 208–17, 4 figs. [18 refs.]

The English summary appended to the paper is as follows:—

"Among the 2,800 autopsies practised in the Service of Pathology of the Central Hospital of Valencia, Venezuela, two cases of echinococcosis were observed. The first case was Venezuelan native of El Tocuyo, Estado Lara, 28 years of age who presented two hepatic cysts of the granular type and the microscopic examination showed the scolex and the typical hooks. This is the second case known of natives of this country. The second case seen was of a Yugoslav forty-six years of age. This one showed a necrotic liver cyst which showed the presence of cuticula and hooks in the contents of the cyst."

MAGATH, T. B., with the technical assistance of Louise ROWLEY. **The Antigen of Echinococcus.** *Amer. J. Clin. Path.* 1959, Jan., v. 31, No. 1, 1–8, 6 figs.

In the Ward Burdick Award Address to the 37th Meeting of the American Society of Clinical Pathologists, at Chicago, Illinois, in 1958, 40 years' experience of the serological diagnosis of hydatid disease in America is discussed.

Many specific serological tests have been devised, but only the Casoni intradermal test and the complement-fixation test are commonly used.

Many antigenic extracts have been prepared from different parts of the larval stage, ranging from the undiluted cyst fluid to complicated extracts of the cyst wall or of the scolices. Each has its disadvantages, as, for example, the untreated cyst fluid which if passed through a Zeitz filter and stored in ampoules, retains its potency for the Casoni test for several years but is not suitable for the complement-fixation test after a few weeks. The addition of Merthiolate [thiomersal] in a concentration of 1:50,000 as suggested by the author 30 years ago preserves the antigenic potency for both tests for many years.

The Casoni intradermal test is reliable (87% in one series) though the test may remain positive some years after a cyst has been removed or has died and has become calcified. The complement-fixation test is also reliable (93%) but the test becomes negative a few months after the removal of a cyst.

The complement-fixing antigen moves with the gamma globulin fraction on paper electrophoresis, but can be separated from the protein by precipitation with cold acetone–ether mixture. The serum antibody is in the gamma globulin fraction. The serum of patients with hydatid disease gives a single line with cyst fluid from *Echinococcus granulosus* with gel diffusion techniques, but double lines or wider bands with cyst fluid from *E. multilocularis*.

W. E. Kershaw

KELLY, T. D. & IZZI, N. **Pulmonary Hydatid Disease in Iraq, with a Review of History and Life History of the Parasite.** *J. Faculty of Med., Baghdad.* 1959, July, v. 1 (n.s.), No. 3, 115–40, 1 diagram & 22 figs. (20 on 5 pls.) [25 refs.]

189 cases of hydatid disease restricted to the lung were seen in Baghdad in 3½ years.

The parasite is maintained in the stray dogs and sheep. 32 out of 37 stray dogs examined were infected, but no infections were found in 24 dogs from European houses. In the Baghdad abattoir the infection rates for yearling lambs, sheep and cattle, were 0 out of 32 examined, 20 out of 67 examined, and 16% respectively, and though no stray dogs were allowed in the vicinity of the abattoir, and all diseased offal was burnt, these measures were not carried out elsewhere.

There are 7 million sheep in Iraq, compared with 150 million in Australia, and the 189 cases of hydatid disease limited to the lungs found in 3½ years in Baghdad can be compared with the incidence in Australia: in 1894 one in every 101 admissions to the southern hospitals of Australia was for hydatid disease, and in 1946–49, 2 cases of hydatid disease had been admitted to two hospitals in Adelaide.

7 of the 189 patients were symptomless, the disease having been found by mass radiography. The others complained of cough, pain or bleeding, and 10 had, in addition, occasional anaphylactic symptoms. The rate of growth was irregular, for in some patients followed up by radiography, the authors found rapid growth alternating with quiescence. The right lung was involved more commonly than the left, and the lower lobe more than any others. The Casoni test was positive in 50, and negative in 20 among those with infected cysts, and positive in 28 and negative in 8 among those with non-infected cysts. Early surgery should be done before lung damage has occurred: 115 operations are reviewed.

W. E. Kershaw

BIOCCA, E. & PAGGI, Lia. Infestazione sperimentale di *Ovis aries* con larve di tricostrongili umani provenienti dall'Iran. [**Experimental Infection of** *Ovis aries* **with** *Trichostrongylus* **Larvae from Man originating in Iran**] *Parassitologia.* Rome. 1959, Apr., v. 1, No. 1, 68–75, 4 figs. on pl. & 1 text fig.

Biocca [above, p. 253] has already recorded the high incidence of *Trichostrongylus* infection in man in Iran, and its hygienic implications; it had previously been noted by STEWART [this *Bulletin*, 1950, v. 47; 385]. The species was not, however, identified: indeed world distribution of this worm has not been extensively recorded, partly because of the difficulty in recovering this very small parasite after treatment and partly because of difficulties of differential diagnosis of species. The authors set out in a useful table the

known distribution of *Trichostrongylus* species in man, by host and geographical region. While the genus can be established from the characteristic ova recovered from faeces, the species can be determined only from study of the adult worm, especially the male. It is common experience that adult worms can rarely be found in faeces after anthelmintic treatment, but they may be detected in the intestines at autopsy. The authors had found in their study in Teheran that specimens from some 200 patients after helminthic treatment were completely negative for *Trichostrongylus*, although many had shown ova in the faeces before treatment. Study of material at autopsy, however, proved unsatisfactory owing to local difficulties in obtaining post-mortem examinations.

The authors therefore tried infection of lambs (*Ovis aries*) with larvae obtained by culture from human faeces, so that adult worms subsequently obtained in the intestines of these animals could be identified specifically. The table referred to above shows that *Ovis aries* is susceptible to all the *Trichostrongylus* species so far known to infect man.

The technique of faecal culture is described. Cultures were made from 10 specimens of faeces each from infected patients in Teheran and Isfahan. Larvae from the centrifuged deposit of each pool were given to a separate lamb aged 5 months by means of an intragastric sound. Some 2 months later each lamb was killed and its intestinal contents examined. From the Teheran specimen [which was a less heavy culture] 6 male and 14 female *Trichostrongylus* were obtained and from the Isfahan specimen 14 male and 18 female. All were identified as *T. orientalis*. The measurements for each batch are listed and some diagnostic features shown in 4 photomicrographs. The authors point out that these findings do not exclude the possibility that other species may infect man in Iran, but in the present study it is clear that *T. orientalis* was predominant. They add that it would be interesting to determine whether man is an habitual host of *T. orientalis* and whether man-to-man transmission occurs, or whether he is an accidental host infected by contact from animal faeces.

The value of this experimental method of differentiating the species of *Trichostrongylus* is clear. The specimens of faeces had been brought by air to the Institute of Parasitology in the University of Rome, of which the senior author is Director. He suggests that the study might with advantage be repeated in Iran with local animals. *H. J. O'D. Burke-Gaffney*

ENTNER, N. & GONZALEZ, Celia. **Fate of Glucose in** *Ascaris lumbricoides*. *Exper. Parasit.* New York. 1959, Oct., v. 8, No. 5, 471–9. [16 refs.]

KIKUCHI, G., RAMIREZ, J. & BARRON, E. S. G. **Electron Transport System in** *Ascaris lumbricoides*. *Biochim. et Biophys. Acta.* 1959, Dec., v. 36, No. 2. 335–42, 4 figs. [17 refs.]

EL BITASH, M. H. & SAIF, M. **Dithiazanine Iodide in the Treatment of** *Ascaris* **Infestation.** *J. Egyptian Med. Ass.* 1958, v. 41, Nos. 11/12, 543–5.

The authors, in Cairo, treated 10 adults and 10 children suffering from ascariasis with dithiazanine iodide in the form of enteric coated tablets containing 100 or 200 mgm. each. No starvation, dietetic restriction or purgatives

were used. Stools were examined for ova by concentration methods before and 10 days after treatment; 3 consecutive negative stools were regarded as evidence of cure.

Adults received 200 mgm. three times daily after meals for 5 consecutive days; children received 100 mgm. on the same schedule. All were cured on the criteria stated, and worms were discharged. The drug was well tolerated and no toxic reactions were demonstrated.

[See also this *Bulletin*, 1959, v. 56, 1039, 1151 *bis*.]

H. J. O'D. Burke-Gaffney

KAGAN, I. G., NORMAN, Lois & ALLAIN, Dorothy S. **Studies on the Serology of Visceral Larva Migrans. I. Hemagglutination and Flocculation Tests with Purified Ascaris Antigens.** *J. Immunology*. 1959, Sept., v. 83, No. 3, 297–301. [10 refs.]

Serious and incapacitating disease, particularly in children, may result from that form of visceral larva migrans which is caused by the larvae of *Toxocara canis* [see this *Bulletin*, 1958, v. 55, 56, also BEAVER, *ibid*., 1959, v. 56, 1262]. Since the larvae seldom reach adult form, diagnosis by examination of the stools for eggs is of no value, and it is obviously important to devise a serological technique which is sufficiently specific to distinguish infection with *T. canis* from other closely allied nematode infections. "The following antigens were tested for specificity in the tannic acid hemagglutination and bentonite flocculation tests: a) Ascaris whole worm and tissue saline extracts; b) polysaccharide whole worm and tissue antigens prepared by ethanol precipitation, and by extraction with formamide; c) a protein antigen prepared by the method of Melcher. Utilizing these two serologic tests antisera prepared against ascarid antigens in rabbits, and toxocarid antigens in rabbits, monkeys and a dog, as well as sera from children presumably infected with visceral larva migrans (Toxocariasis) were used to evaluate the specificity of antigens. All but 2 of 14 antigens were serologically active, but no specificity was demonstrated by the antigens employed." Commenting on the lack of generic specificity shown by these antigens the authors state that studies aimed at the further purification of the antigens are now in progress.

[For earlier studies by these authors and their colleagues and for further information concerning the highly specialized techniques used by them, see *ibid*., 1958, v. 55, 1257; 1959, v. 56, 547, 856].

R. M. Gordon

RAGHAVAN, N. G. S., NAIR, C. P. & KRISHNAN, K. S. **Filariasis in Travancore-Cochin (Kerala State). Part III. Hill-Tribe Settlements in Quilon and Trivandrum Districts.** *Indian J. Malariology*. 1958, Sept., v. 12, No. 3, 183–93, 1 graph.

Kerala State lies between the Arabian Sea and the Western Ghats, and an extensive undulating region with low hills and narrow valleys runs from the coast to the foothills and the mountains. The whole coastal tract is highly endemic for filariasis, but there is little elsewhere, except among small groups

of forest tribes in South Kerala, in settlements in isolated clearings on the top of a hill surrounded by narrow valleys or on steep mountain slopes. Both malaria and filariasis occur in the people in these settlements [see this *Bulletin*, 1939, v. 36, 148].

The National Malarial Control Programme had carried out a campaign in these settlements for 4 years, including the use of residual insecticides, and a combined filarial and malarial survey was done in 1956–7.

The survey was done between 8.30 p.m. and 1 a.m. Clinical manifestations were enquired for but no examinations were done. Thick and thin blood films in the same slide were examined for malaria parasites and a thick film of about 20 cmm. was made for identifying and counting the microfilariae.

Adult mosquitoes were caught in all the houses, cattle sheds, mixed dwellings and in possible outdoor resting places nearby on the day following the night survey. Night collections were also made in the houses in some settlements. The mosquitoes were dissected for malarial and filarial infections.

471 people or 42% of the population in 5 settlements were examined. 2 persons had enlarged spleens but no malarial parasites were found. *Brugia* [*Wuchereria*] *malayi* was the only filaria found and the infection, disease and endemicity rates were 25·9%, 28·9% and 46·3%, respectively. The infection rate rose steadily to the age of 30 years, where it remained unchanged. Males had a higher disease rate than the females.

Of the anophelines, *Anopheles jamesi* was the most numerous, then *A. jeyporiensis*. *Culex vishnui* was the commonest culicine, and *Mansonia* (*Mansonioides*) *uniformis* was the only member of the subgenus; it entered houses during the early hours of the night, particularly between 7 and 8 p.m. *Pistia stratiotes* was not found, but *Mansonioides* egg clusters were found on the undersurface of blades of grass growing in seepage channels. The larvae which hatched out in the laboratory had been found attached to algae collected from the breeding places,

M. uniformis was identified as the vector of *B. malayi*, for 3 had infective larvae in the head and proboscis out of 206 dissected and 10 *C. vishnui* out of 397 dissected had developing forms only.

It seemed, on comparing the results of this survey with those obtained by Iyengar on some of the settlements, that during the last 20 years the incidence of filariasis had declined. As no pre-control filarial surveys had been carried out, the effect of the application of residual insecticides for malarial control could not be assessed.

The gradual increase of infection reached a constant level at the age of 30 years, the disease rate rising to a maximum at the age of 50 years, then falling. The absence of genital lesions and the fall in infection rate in those with the disease are similar to the findings of Iyengar [see *ibid.*, 1939, v. 36, 148]; Raghavan and Krishnan [*ibid.*, 1950, v. 47, 1110] and Jaswant Singh *et al.* [*ibid.*, 1957, v. 54, 462] in other areas where *B. malayi* occurs.

Though *M. uniformis* had been found by Iyengar to be infected in some nearby areas not included in this survey, he had not found any in one area included, though he had found *B. malayi*. As malaria was hyperendemic, it seemed possible to the authors that anophelines might have been responsible for the transmission of both infections but this survey had shown this not to be so. *W. E. Kershaw*

NELSON, G. S. **The Identification of Infective Filarial Larvae in Mosquitoes: with a Note on the Species found in "Wild" Mosquitoes on the Kenya Coast.** *J. Helminthology.* 1959, v. 33, Nos. 2/3, 233–56, 8 figs. [Numerous refs.]

The author's summary and conclusions are as follows:—

"1. At least twenty-two species of filarial worms are known to develop in mosquitoes. Filarial larvae of non-human origin must often be present in mosquitoes dissected during filariasis surveys yet the larvae seen are commonly assumed to be of human origin.

"2. On Pate island off the Kenya coast where bancroftian filariasis is prevalent, several distinct species of infective larvae were found in mosquitoes both in the houses and in the bush. Seven species of filarial worms were found in the local animals and a collection of known infective larvae was made by feeding mosquitoes on these different infections. A study of the material in this 'reference collection' showed that many of the larvae in 'wild' mosquitoes could be identified with confidence.

"3. A technique has been developed for the dissection of preserved and stained mosquitoes [this *Bulletin*, 1958, v. 55, 1360]; this method has many advantages and can be used in routine filariasis surveys.

"4. The characters which were most useful in differentiating the infective larvae were: the length; the position of the anus; and the shape of the caudal extremity. Eight species of infective larvae were available for study, these are described and illustrated: *W. bancrofti*, *W. malayi*, *W. pahangi*, *W. patei*, *D. corynodes*, *D. repens*, *D. immitis* and *S. equina*. The literature dealing with a further fourteen species is reviewed.

"5. A simple key has been produced to help identify the species of infective larvae found in mosquitoes.

"6. On the Kenya coast *W. bancrofti* infective larvae have been found only in *C. fatigans*, *A. gambiae* and *A. funestus*. Infective larvae of animal origin which might easily be mistaken for those of *W. bancrofti* have been found in *Ae. pembaensis*, *Ae. aegypti*, *M. uniformis* and *M. africanus*.

"7. Formulae for transmission indices based on infection rates in insect vectors are of little value unless there is confidence in specific identification.

"8. A study of the infective larvae in *Simulium neavei* from an onchocerciasis area in Uganda has shown that not all the larvae are of human origin. A closer examination of the morphology of infective larvae in the vectors of filarial parasites of man in other areas will almost certainly show that the interpretation of infection rates may be complicated by the presence of infections of non-human origin.

"9. Feeding experiments were carried out with *Aedes pembaensis* and *Ae. aegypti* on a donkey infected with *Setaria equina*; both of these mosquitoes proved to be suitable vectors of this filarial worm."

[The abstracter, when examining the infective forms of *Loa loa* obtained from *Chrysops* sp., has tried out the technique described for staining these worms and has found it excellent. The simple key which has been produced to help in identifying the species of infective larvae found in mosquitoes is a good start to the solution of a problem which must grow in size and complexity as further species of filaria, other than those known to develop in man, are found in "wild caught" mosquitoes.] *R. M. Gordon*

NARAYANDAS, M. G. **New Fixatives for Staining Microfilariae.** *Indian J. Malariology.* 1958, Sept., v. 12, No. 3, 209–15. [13 refs.]

Acid alcohol has been investigated as a fixative for blood films containing the microfilariae of *Wuchereria bancrofti*, *Brugia* [*W.*] *malayi*, *Dirofilaria immitis*, *D. repens* and in infections in the lizard and the partridge. Delafield's and Ehrlich's haematoxylin, Giemsa, JSB, and Schiff's reagent followed by Feulgen's technique were used, and better results were obtained after fixing in a 3 : 1 mixture of absolute alcohol and normal hydrochloric acid than in either reagent alone. The nuclei of the microfilariae and the developing stages of infective larvae of *W. bancrofti* gave very clear appearances by Feulgen's technique. *W. E. Kershaw*

BÈZES, H. & GOUDOTÉ, E. A propos du traitement chirurgical des éléphantiasis des membres: l'exérèse des tissus pathologiques suivie de greffes dermo-épidermiques (10 observations). [**Surgical Treatment of Elephantiasis of the Limbs: Exeresis of Pathological Tissue followed by Skin Grafting. Observations in 10 Cases**] *Bull. Méd. de l'A.O.F.* Dakar. 1958, Apr.–June, v. 3, No. 2, 230–38, 7 figs.

RODGER, F. C. **The Dissolution of Microfilariae of *Onchocerca volvulus* in the Human Eye and its Effect on the Tissues.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1959, Sept., v. 53, No. 5, 400–403, 7 figs. on 2 pls.

The author began his investigation by studying the morphology of the microfilariae and the histology of the tissues surrounding them in 3 lightly and recently infected corneas, and states that without these preliminary studies ". . . it would have been almost impossible to make sense of the heavily infected chronic eyes, which comprise after all the majority of eyeballs enucleated ".

In a recently invaded eye, the microfilaria can be said to have been alive at the moment the eye was excised and both parasite and tissue present a normal appearance. The changed appearance of the microfilaria as it is absorbed after death and the corresponding changes in the host's tissues are considered as occurring in four stages. (1) Increased affinity of the soma of the parasite to the stain (" somatic staining ") occurs. No cellular reaction is observable in the surrounding tissues. (2) The nuclei become less distinct and the body of the parasite becomes irregularly swollen (stage of " ballooning "). In the surrounding tissue " A few eosinophil leucocytes were invariably closely applied to the parasite body at this stage ". (3) The body of the parasite now breaks up abruptly into fragments (stage of " fragmentation "). In the tissue the number of eosinophils increases enormously and a few round cells can be seen. " The local cyto-architecture probably determines the number and dispersal of inflammatory cells. In the potentially-wide space between the epithelium and Bowman's membrane they cluster round the parasite in large numbers ; in the more dense substantia propria the inflammatory cells, required to pass along the narrow interstitial spaces, are not so closely applied to the disintegrating body." (4) As the fragments of the microfilariae become smaller and fewer, the surrounding tissue stains diffusely (stage of " diffusion and absorption ") and eosinophils and fibroblasts are numerous, while plasma cells

and lymphocytes have also increased in number. Coinciding with this cellular invasion into the cornea, new capillaries grow towards the parasite body, and at this stage they are often already close to the inflammatory focus. It appears probable that after the parasite has distintegrated, " the toxic products linger on, diffusing very slowly from the primary focus into the neighbouring tissues. In this way adjacent parts may be affected without necessarily being the locus of a dead parasite ".

This paper is a clear exposition of the views of a school of thought which considers that the " mf. of *O. volvulus* is a good example of a perfectly adapted parasite, and that the inflammatory changes observed in the cornea are caused by the products of the dissolution of their bodies, and not by any exotoxin secreted by them or by the adult worms when alive, as other workers have believed ". *R. M. Gordon*

SHIRAKAWA, M. **An Experimental Study on a New Final Host of** *Gnathostoma spinigerum*. *Kurume Med. J.* 1959, v. 6, No. 1, 11–23, 17 figs.

The English summary appended to the paper is as follows:—

" Up to the time of this experiment, the final hosts of *Gnathostoma spinigerum* in tigers, cats, dogs and leopards in the natural infection, and cats and dogs in the experimental infection were ascertained.

" The author removed the third stage larvae of *Gnathostoma spinigerum* from the muscle of *Ophicephalus argus*, a kind of fresh-water fish, and administered them perorally to a fox, *Vulpes vulpes japonica*.

" Subsequently, five and a half months later a typical stomach tumor was found, just as in the cases of cats and dogs, and nine imagines of this nematode (three males and six females) were discovered inside the tumor. Also the fertilized eggs of this nematode were detected in the feces in the rectum of the animal.

" According to these results, the author confirmed experimentally that the fox, as well as cats and dogs, was able to serve as a complete final host of *Gnathostoma spinigerum*. The fox was therefore added as a new final host of this nematode.

" Research, however, is continuously regarding the existence of the natural infection of *Gnathostoma spinigerum* in the fox."

RICCI, M. Sulla influenza dell'ambiente scolastico nella diffusione della ossiuriasi. [**The Effect of the School Environment on the Spread of Enterobiasis**] *Riv. di Parassit.* Rome. 1959, Sept., v. 20, No. 3, 153–64, 3 figs. English summary.

Ricci refers to his previous investigations on the island of Ischia [this *Bulletin*, 1953, v. 50, 327] where he used Graham's scotch tape technique to examine schoolchildren at the beginning and the end of the school year and showed that school attendance was an important factor in the spread of enterobiasis.

He has now carried out further investigations in Latina Province and this time he has stepped up his yearly number of examinations to 4, namely, in October, January, March and May. He selected 619 schoolchildren, aged 6 to

12 years, but only 513 were eventually subjected to all 4 examinations and taken into account in the result. They represented all 5 elementary classes in each of 3 separate schools and they came from 19 separate classrooms altogether. Each periodic examination was completed within one week. The schools were situated in the 3 localities of Sabotino, Podgora and Piave and the percentage infection rate (*Enterobius*) found at the October examination was 41·33, 51·44 and 59·63 respectively.

The Piave children were then given piperazine treatment and their percentage infection dropped to 11·93 as a result. By the time of the January examination, however, they were shown to have become very rapidly re-infected, with a percentage of 47·71 as against 58·67 for Sabotino and 58·17 for Podgora. The percentage infection rates which were found at the next 2 examinations in Sabotino, Podgora and Piave schools respectively were 61·22, 63·94 and 59·63 in March and 68·37, 70·19 and 66·97 in May, towards the end of the school year.

The 3 localities had a comparable standard of environmental sanitation and these children had started school after the summer holidays with about the same level of *Enterobius* infection, and Ricci's findings stress the importance of school attendance in the spread of enterobiasis. *J. Cauchi*

NORMAN, Lois & SADUN, E. H. **The Use of Metabolic Antigens in the Flocculation Tests for the Serologic Diagnosis of Trichinosis.** *J. Parasitology*. 1959, Oct., v. 45, No. 5, 485–9.

Previous work on this subject has been described in earlier papers by SADUN and NORMAN [this *Bulletin*, 1956, v. 53, 644; 1957, v. 54, 1116]. Rats were infected with the larvae of *Trichinella*, and the subsequent crop of larvae was obtained from the muscles by pepsin digestion. These larvae were then used to infect rabbits or pigs, or to prepare metabolic antigens or somatic antigens according to the methods given in the previous papers. The flocculation test was carried out according to the technique of BOZICEVICH *et al.* [*ibid.*, 1952, v. 49, 431].

Human sera were obtained from 1,086 persons suspected of infection with trichiniasis; 810 were negative with both antigens, 216 positive with both, 52 were positive with the metabolic antigen and 8 with the somatic. Flocculation with the metabolic antigen was more sensitive than with the somatic antigen. Of 50 of the human sera (where the diagnosis of trichiniasis was practically certain), 46 were positive with both antigens, 3 were negative with metabolic antigens alone and one with somatic antigen alone. In sera from normal and infected pigs, the two antigens gave closely similar results. Sera from 163 wild animals in Southern Georgia (U.S.A.) were tested, and 5 were positive with the antigens in a titre of 1 in 5; since all these animals were infected with various nematodes, it is concluded that these results indicate that the authors' test is probably specific for *Trichinella*. Sera were taken from rabbits which had been infected with *Trichinella* larvae and from rabbits which had been immunized with the metabolic or with the somatic antigen, and the attempt was made to absorb specifically the antibodies reacting with the somatic and with the metabolic antigens respectively. The results showed that antibodies were absorbed by the homologous antigen more than by the heterologous antigen, but this absorption produced a considerable lowering in the

titre with the heterologous antigen; apparently there is considerable overlap between these two antigens. *F. Hawking*

INNELLA, Filomena & REDNER, W. J. **Latex-Agglutination Serologic Test for Trichinosis. Preliminary Report.** *J. Amer. Med. Ass.* 1959, Oct. 17, v. 171, No. 7, 885–7.

The authors describe an agglutination test done with latex (Polystyrene) particles, which they have developed for the diagnosis of trichiniasis. The results obtained with this test are compared with those obtained with a complement-fixation test.

Trichinella extract was made by the method of BOZICEVICH *et al.* [this *Bulletin*, 1952, v. 49, 431] and was freeze-dried in individual vials in volumes sufficient for one day's tests. The dried extract used had been stored for 3 years without loss of activity. The complement-fixation test used was a modification of the Kolmer test described by Innella (*Army Medical Laboratory Activity Report, New York, First U.S. Army Medical Laboratory*, 1956, Dec. 31, p. 18).

The *Trichinella*-latex agglutination test used is a modification of the diagnostic test devised by SINGER and PLOTZ (*Amer. J. Med.*, 1956, v. 21, 888) for the diagnosis of rheumatoid arthritis. A stock suspension of latex particles (0·81 μ in size) is prepared in distilled water and then added to *Trichinella* extract and glycine saline buffer solution. The quantities are: *Trichinella* extract 1·0 ml.; glycine saline buffer solution (*p*H 8·2) 4·0 ml.; stock solution of latex particles 0·2 ml. This volume suffices for 50 tests. The test is done in small tubes (8·5 by 75 mm.) with 0·1 ml. antigen and 0·1 ml. serum. After incubation for 30 minutes at 37°C. the tests are cooled at room temperature and centrifuged at 2,000 r.p.m. for three minutes. Readings are determined by the degree of precipitate flocculation as 4+, 3+, 2+, 1+, or ±. The 4+, 3+ and 2+ tests have sparkling, clear supernates, and some cloudiness appears at the 1+ and ± readings. A negative test is cloudy and there is no flocculation. The authors have used an antigen control consisting of glycine buffer solution and latex particles only with each serum tested, to control non-specific agglutination of latex particles, which has not been observed to date.

The test may also be done on slides, but latex particles of larger size and a more concentrated *Trichinella* extract are then needed. This test is done with "one drop of latex Trichinella antigen mixed with one drop of serum"; but the tube test is preferred.

Tube tests were done on lyophilized stored serum, preserved with thimerosal [thiomersal], from known cases of trichiniasis, and on preserved, lyophilized or stored sera from persons with syphilis, rheumatoid arthritis or echinococciasis; and on preserved, lyophilized stored and fresh sera from persons considered to be normal controls. The complement-fixation and latex-particle-agglutination tests were done on undiluted sera and all positive sera were titrated in both methods. Tables give the results. These show that the degree of specificity of the latex test is remarkably parallel to that of the complement-fixation test used by the authors and that, in some cases, the latex test was the more sensitive.

Although neither fresh sera from patients infected with *Trichinella*, nor sera from patients with strongyloidiasis, filariasis or schistosomiasis, were tested, the authors think that the results obtained are encouraging. The latex test is very simple to do, whereas the complement-fixation test takes time, is expensive and needs well-trained technicians, and the authors' experience of the bentonite test of Bozicevich *et al.* [*loc. cit.*] (not used in the present enquiry) has been that it is much more laborious and subjective in interpretation than the latex test, for which antigen extracts can be made in large quantities and lyophilized and used, without loss of activity, for a long time. The latex slide test is, moreover, useful, because of its simplicity, for tests done in dispensaries and doctors' surgeries, where tubes, water-baths and centrifuges may not be available. It is also useful for epidemiological work.

G. Lapage

LARSH, J. E., Jr., RACE, G. J. & GOULSON, H. T. **A Histopathologic Study of Mice Immunized with Irradiated Larvae of** *Trichinella spiralis*. *J. Infect. Dis.* 1959, Mar.–Apr., v. 104, No. 2, 156–63, 8 figs. [10 refs.]

Larsh and Race showed [see this *Bulletin*, 1954, v. 51, 1088] that infection of mice with *Trichinella spiralis* provoked a striking immunity which is associated with the production of serum antibodies and a characteristic inflammatory response in the jejunum.

KIM (*J. Elisha Mitchell Sci. Soc.*, 1957, v. 73, 308) showed that immunity could be provoked by exposure to infection by larvae irradiated with dosages of 1,750 r to 7,000 r and that a dose of between 5,250 r and 7,000 r produced a demonstrable immunity while the development of such larvae did not progress beyond the pre-adult stage.

The authors carried out experiments to determine whether the production of serum antibodies and the characteristic histological response in the jejunum accompanied the immune response to infection with those larvae whose development was arrested by high dose irradiation, as happens in normal infections.

Mice were given 5 successive infections with larvae irradiated at 7,000 r and were then exposed to infection with non-irradiated larvae. A similar group was exposed to infections 5 times with non-irradiated larvae, and then exposed a sixth time, and a group of control mice was exposed to non-irradiated larvae never having been exposed before.

The level of immunity in mice exposed previously to irradiated or non-irradiated larvae was similar; somewhat fewer adult worms were established in these two groups than in the control group, and the number of larvae found in the muscles of the animals in the groups immunized by either method was about one-third of those found in the controls. The titre of serum antibodies was considerably higher in the animals immunized with non-irradiated larvae than in those immunized with irradiated larvae. The lesions in the jejunum in those immunized were similar in character histologically, though they were less severe and evolved more slowly in those immunized by exposed irradiated larvae than in the others.

The pre-adult stage of *T. spiralis* can therefore stimulate demonstrable immunity associated with the development of serum antibodies and characteristic inflammatory responses in the intestine. *W. E. Kershaw*

DEFICIENCY DISEASES

CHADWICK, J. M., FAWCETT, J. S. & WARBURTON, F. G. **Amino-Aciduria in a Case of Scurvy.** *Amer. J. Clin. Nutrition.* 1959, Nov.–Dec., v. 7, No. 6, 721–5, 3 figs. [15 refs.]

HOLMES, E. G. & DARKE, Sylvia J. **Malnutrition in African Adults. 4. Intestinal Absorption.** *Brit. J. Nutrition.* 1959, v. 13, No. 3, 266–77. [21 refs.]

Part of the nutritive value of any food must inevitably be lost in the faeces. The estimates of such losses, which are used in calculating the nutritive value of diets today, are based on experiments mostly carried out over 50 years ago on subjects consuming typical American or European diets of the time. Such estimates may not be applicable to African diets. This paper records the results of studies on 8 groups of people in Africa, in which over 170 observations were made during periods of 3 to 5 days or longer when food intake and faecal output were measured.

The dry weight of stools varied from 26 to 98 gm./day in the different groups. Absorption of energy varied from 88 to 95%, of nitrogen from 71 to 90% and of fat from 79 to 97%. There were significant differences between the groups, depending on the nature of the diet.

The application of the factors for faecal losses given in standard textbooks may overestimate the nutritive value of an African diet to a considerable extent. This is probably of little significance when foods are freely available. But when food supplies, particularly protein, are limited, this diminished absorption may be of practical importance.

[This paper is a notable contribution to physiology in Africa. It is hoped that the authors will be able to continue this study and so provide systematic data from which reliable estimates of the nutritive value of African diets can be drawn up.] *R. Passmore*

DARKE, Sylvia J. **Malnutrition in African Adults. 5. Effects of Hookworm Infestation on Absorption of Foodstuffs.** *Brit. J. Nutrition.* 1959, v. 13, No. 3, 278–82.

This paper reports an extension of the work recorded in the previous abstract [see above]. Alimentary absorption of nitrogen in a group of 10 patients with hookworm infection varied from 41 to 78%. This relative failure of absorption may lead to signs of protein-malnutrition and may also contribute to the severe anaemia sometimes found associated with a heavy load of hookworms.

[For previous parts of this study, see this *Bulletin*, 1954, v. 51, 1090, 1091; 1957, v. 54, 197.] *R. Passmore*

NICOL, B. M. **The Calorie Requirements of Nigerian Peasant Farmers.** *Brit. J. Nutrition.* 1959, v. 13, No. 3, 293–306, 1 fig.

The food consumption of 7 groups of rural Nigerian peasants was measured. The calorie intakes were calculated from tables and are compared with FAO

estimates of requirements. The dietary intakes obtained by both men and women over 12 years of age agree well with estimates of requirements in most groups. In some areas where cattle herdsmen and farmers were very active physically, food intake was in excess of the estimated need. In one district where food was short, only 85% of the calculated requirement was met.

Most of the children under 12 were not given enough food to meet the estimated need. The parents in rural Nigeria often do not realize the needs of growing children. The head of the family and other men tend to get priority for food over the women, and the children come last. *R. Passmore*

NICOL, B. M. **The Protein Requirements of Nigerian Peasant Farmers.** *Brit. J. Nutrition.* 1959, v. 13, No. 3, 307–20. [26 refs.]

The quantity and quality of the protein consumed by five communities of Nigerian peasants whose staple foods were sorghum and other millets were compared with those of two groups of peasants subsisting on yams. The mean daily intakes of protein were 85 gm. and 51 gm. respectively. The corresponding mean protein scores (FAO Committee on Protein Requirements, 1957 [this *Bulletin*, 1958, v. 55, 1267]) were 77 and 50. The figures for the millet-eating areas were well above the safe practical allowance recommended by FAO. This level was not reached in the yam-eating areas, though the minimum suggested protein requirement appears to have been met. Nevertheless, in adults, the mean level of plasma proteins was the same (7·8 gm. 100 ml.) in the two areas and the haemoglobin levels were also similar.

The incidence of protein malnutrition in children up to 9 years old was 2·2% in the millet-eating areas and 5·3% in the yam-eating areas.

R. Passmore

LADELL, W. S. S. & PHILLIPS, P. G. **Groundnut Flour as a Protein Source in the Nigerian Diet.** *J. Trop. Med. & Hyg.* 1959, Oct., v. 62, No. 10, 229–37, 2 figs. [17 refs.]

Trials are reported of a food in which groundnut flour was added to cassava. The product was acceptable to Nigerians and balance studies indicate that the protein mixture was well utilized. *R. Passmore*

ACHARI, G. & MISRA, K. C. **Plasma Proteins in Malnutrition.** *Calcutta Med. J.* 1959, June, v. 56, No. 6, 190–94. [15 refs.]

Plasma protein was determined in about 14 normal persons selected at random, and in 3 groups of 14 patients suffering from malnutrition with mild, moderate or severe oedema, admitted to the Patna Medical College Hospital or attending as out-patients. The total protein was determined after WADDELL and HILL (*J. Lab. & Clin. Med.*, 1956, v. 48, 311) by measuring in the ultra-violet spectrum the absorption at 215 mμ and subtracting from this value that found at 225 mμ. Albumin was separated from the total protein by precipitation of the globulins with sodium sulphate and ether in accordance with the accepted procedure of Kingsley. There was a significant fall in total plasma protein in the patients with oedema of malnutrition and this could be

related to a low level of albumin. The changes were greater with increasing severity of the oedema. Blood transfusion improved the clinical condition and associated with this there was an increase in total plasma protein and plasma albumin. *H. Lehmann*

DUPIN, H. Étude des carences protidiques observées chez l'enfant en pays tropical (Kwashiorkor). [**A Study of Protein Deficiency, as observed in the Infant in Tropical Countries. (Kwashiorkor)**] [Thesis]. 169 pp., 55 figs. [294 refs.] 1958. Paris: Librairie Arnette.

British workers in tropical medicine for one reason or another are often not sufficiently familiar with the work done by their French colleagues. This book provides an opportunity for those interested in kwashiorkor to make good any deficiency in this respect. It is a thesis presented for a doctorate at the University of Paris and is based on several years' experience in Professor Senecal's clinic at Dakar and a thorough study of the literature. The bibliography contains 294 references covering papers from all over Africa, as well as from Asia and Latin America.

The exposition is characterized by clarity and common sense, rather than by the originality of the findings. Little is said about the social aspects of the disease, but the clinical features, therapeutics, chemical pathology and morbid histology are fully set out and discussed. Dr. Dupin's monograph worthily succeeds BROCK and AUTRET, *Kwashiorkor in Africa* [this *Bulletin*, 1952, v. 49, 988], and TROWELL *et al.*, *Kwashiorkor* [*ibid.*, 1955, v. 52, 496], and can be recommended as the best up-to-date account of his subject. *R. Passmore*

SRIKANTIA, S. G. & GOPALAN, C. **Role of Ferritin in Nutritional Edema.** *J. Applied Physiol.* 1959, Sept., v. 14, No. 5, 829–33, 2 figs. [16 refs.]

Monkeys on a poor vegetarian diet low in protein developed oedema after 13 to 16 weeks. After about 12 weeks, active ferritin could be demonstrated in the blood and this preceded a marked expansion in the thiocyanate space. During nutritional rehabilitation, ferritin disappeared from the circulation before the thiocyanate space returned to normal. The results are consistent with the theory that ferritin production may be part of the mechanism leading to nutritional oedema and that this protein may exert a marked antidiuretic effect, mediated through the posterior pituitary. *R. Passmore*

EDOZIEN, J. C. **Blood Keto-Acids in Kwashiorkor.** [Correspondence.] *Nature.* 1959, Oct. 10, v. 184, Suppl. No. 15, 1150, 1 fig.

Paper chromatograms showed the presence of increased amounts of ketoacids in the blood of patients with kwashiorkor. Estimations of α-ketoglutaric acid in blood showed that 5 out of 25 patients with kwashiorkor had levels above 0·22 mgm./100 ml., the upper limit of normal values. In 14 out of these 25 patients, the blood pyruvate was above 1·0 mgm./100 ml., the upper limit. The blood pyruvate level fell to normal when the patients were treated with milk, but was not affected by large doses of thiamine, in the absence of protein therapy. It is suggested that the accumulation of pyruvate may be due, at least in part, to deficiency of sulphydryl groups. *R. Passmore*

SHETH, S. C. & WARERKAR, U. R. **Liver in Malnutrition.** *Indian J. Child Health.* 1959, Sept., v. 8, No. 9, 468–75. [36 refs.]

This paper is based on the liver function tests and biopsy material from 27 patients with protein malnutrition. Enlargement of the liver was inconstant and the liver function tests were not closely correlated with the severity of the illness. Fatty deposition and stellate fibrosis in the liver frequently occurred, but the authors found no evidence that malnutrition led directly to cirrhosis of the liver. *R. Passmore*

SPRUE

BUTTERWORTH, C. E., Jr., PEREZ-SANTIAGO, E., MARTINEZ DE JESUS, J. & SANTINI, R. **Studies on the Oral and Parenteral Administration of D(+) Xylose.** *New England J. of Med.* 1959, July 23, v. 261, No. 4, 157–64, 3 figs. [25 refs.]

A large-scale comparison between the urinary excretion of D(+) xylose after oral ingestion and after intravenous infusion is presented in this article. For the administration by mouth 25 gm. were dissolved in 250 ml. of tap water and given to fasting subjects. All urine excreted during the next 5 hours was collected. Determination of xylose was made by the method of ROE and RICE for measuring pentoses (*J. Biol. Chem.*, 1948, v. 173, 507) within three hours of collection; or when it was necessary to postpone the chemical estimation the urine was stored in the refrigerator. For intravenous administration xylose was given as 2·5% solution in saline over a 1-hour period. In 114 normal subjects—50 healthy Puerto Rican student nurses, 50 healthy Puerto Rican recruits, and 14 members of the laboratory staff—the amount of xylose excreted in 5 hours after the 25 gm. oral dose was 5·7 ± 1·4 gm. The corresponding amount in 49 patients with untreated sprue was 1·4 ± 0·7 gm.

The diagnosis was based on the clinical picture of chronic diarrhoea, weight loss, glossitis, weakness and megaloblastic changes in the bone-marrow. In addition malabsorption had been shown to be present by two or more tests and the diagnosis had not been made on the basis of the xylose absorption tests alone. These tests for malabsorption were either measurement of serum vitamin A level after ingestion of 300,000 Units, or serum turbidity measurement after administration of 30 gm. of butter, or faecal fat determination during fat balance studies.

In 28 patients with treated sprue the urinary xylose excretion was midway between those of the normal and of the untreated group—3·5 ± 1·3 gm.

Less significant though still striking results were obtained after a 5 gm. oral dose. In 29 normal subjects, 25 patients with untreated sprue, and 23 patients with treated sprue the excretion values were respectively 1·7 ± 0·25, 0·55 ± 0·23, and 1·2 ± 0·45 gm. In 45 patients suffering from diseases which made a differential diagnosis from sprue desirable, xylose excretion was normal in the oral test with only a few exceptions. Values under 2·5 gm. of urinary xylose were seen in 2 of 3 patients with pernicious anaemia in relapse, in 1 of 9 women with megaloblastic anaemia of pregnancy, and in 1 case of lymphosarcoma involving the small intestines. Results were uniformly normal in 7 patients with iron deficiency anaemia.

Urinary excretion of xylose after intravenous administration was measured in 10 normal subjects and in 22 patients with sprue, 15 of them untreated and 7 treated. The mean urinary xylose values were essentially the same in all three groups.

This represents the first extensive comparison of the results of oral and parenteral administration of xylose to sprue patients and provides the evidence that the oral tests are a measure of intestinal absorption. In view of its accuracy and simplicity the authors recommend the xylose test for a more widespread use in the diagnosis of malabsorption syndromes. *H. Lehmann*

HAEMATOLOGY

SASSEN, A. Étude des protéines sériques en rapport avec les tests de floculation. [**Study of Serum Proteins in Relation to Flocculation Tests**] *Ann. Soc. Belge de Méd. Trop.* 1959, Apr. 30, v. 39, No. 2, 187–200, 1 graph. [29 refs.]

In this study from Elisabethville in the Belgian Congo results of various serum flocculation tests have been correlated to the levels of the different serum protein fractions. 4 flocculation tests were found to be specifically determined by the combination of a low albumin level with a rise in the gamma globulin. Both alterations were required and neither of the two by themselves caused increased flocculation. These four were zinc sulphate turbidity, Lugol turbidity, the Takata-Ara test, and a modification of the Takata-Ara test introduced by MACLAGAN and his colleagues which allows results to be read in a photoelectric colorimeter (*Clin. Chim. Acta,* 1957, v. 2, 49). Other tests were influenced by other protein fractions as well. The 1:20 water dilution test and the cephalin-cholesterol flocculation test were markedly dependent on a rise in alpha and beta globulins, and cadmium sulphate turbidity could be correlated to the level of the alpha 1 globulin.

In view of the higher gamma globulin levels in Africans, different tests are recommended for assessing liver damage in Europeans and in Africans. 3 are suggested as a battery to be used in each race; one of these should be for Europeans as well as for Africans—the 1:20 dilution of serum in double distilled water. It is not too sensitive and in addition to being correlated to the gamma globulin it shows increase in flocculation with greater pathological change in muco- and lipoproteins. The two other tests recommended for Africans are more specifically related to rise in gamma globulin, one of them sensitive—the zinc sulphate turbidity, and one less sensitive—the Lugol test. In Europeans the very sensitive cadmium sulphate turbidity and cephalin-cholesterol flocculation are better tests for liver damage. *H. Lehmann*

QUEVAL, R. & PELISSIER, A. Contribution à l'étude électrophorétique des problèmes sériques des Africains du Tchad. [**Electrophoretic Analysis of Serum Proteins of Africans in Tchad**] *Bull. Soc. Path. Exot.* 1959, May–June, v. 52, No. 3, 385–403, 3 figs. [25 refs.]

Analysis of serum proteins by electrophoretic methods was carried out on 55 men and 45 women in Fort Lamy, Tchad Territory; those selected were

adult, indigenous, and free from overt disease. The following results were obtained:—

Albumin	mean	36·8%	(standard	deviation	6·98)
Alpha$_1$ globulin	„	6·45%	(„	„	2·22)
Alpha$_2$ globulin	„	12·11%	(„	„	2·60)
Beta globulin	„	14·59%	(„	„	3·78)
Gamma globulin	„	30·05%	(„	„	5·85)
A/G ratio	„	0·60	(„	„	0·18)

The possible roles of nutritional, parasitic, and hepatic factors are discussed at length, though the original observations throw no light on these. However, an opportunity presented itself of estimating the serum proteins of a group of 32 persons afflicted with viral hepatitis, and these showed a still greater departure from European standards, *e.g.* the mean albumin level was 31·5%, and the mean gamma globulin 35·6%. *Alan B. Raper*

MEYER. G. & AUJARD, C. Les principales constantes biochimiques du serum de différents groupes ethniques malgaches et comoriens en rapport avec leur écologie. [**Principal Biochemical Constants of the Serum of Different Ethnic Groups in Madagascar and the Comoro Islands in Relation to Ecology**] *Arch. Inst. Pasteur de Madagascar.* 1959, v. 27, 107–54, 1 map.

12 ethnic groups in Madagascar have been examined for their serum constituents. These were: serum potassium, sodium, calcium, phosphorus, glucose, non-protein nitrogen, urea, and total protein as well as protein fractions separated by electrophoresis. Each group is also described in detail as regards habitat, customs, dress, etc. This report forms the first part of a major survey, and the second half which has not yet appeared will contain details of the techniques employed and a discussion of the results obtained. The results are tabulated, without comment, in the present paper. *H. Lehmann*

WORLD HEALTH ORGANIZATION. TECHNICAL REPORT SER. No. 182. **Iron Deficiency Anaemia. Report of a Study Group.** Geneva, 29 September–4 October 1958. 15 pp. 1959. Geneva: Palais des Nations. [Sales agent for U.K., H.M. Stationery Office.] [1s. 9d.; $0.30; Sw.fr. 1.–.]

This is a most important document issued by the World Health Organization as the result of the deliberations of its study group on iron deficiency anaemia.

The Report begins by outlining the paramount importance of anaemia as a public health problem in the underdeveloped and tropical areas of the world. Although common in the adult male, anaemia affects particularly expectant and nursing mothers, infants and young children. In the majority of cases iron alone will cause prompt improvement, but in some, other factors, such as protein, seem to be necessary as well. In India dietary surveys have shown that the iron intake is adequate, and that the widespread iron deficiency anaemia must therefore be due to poor absorption or excessive losses or both. Thus iron deficiency anaemia is defined as being brought about primarily by iron

deficiency in the body, characterized by progression from a normocytic, normochromic blood picture to one that is microcytic and hypochromic, and responding to treatment with iron.

It is necessary to have standards of reference to compare the results of surveys in different parts of the world. The Group considered that optimum haematological values are the same for temperate and tropical zones. The cyanmethaemoglobin method, the oxyhaemoglobin method as measured by the Grey-Wedge photometer, and the acid haematin method as measured by the Sahli technique, are all acceptable procedures for haemoglobin estimation. The agreed standards are summarized in the following table:

Values below which anaemia can be considered to exist

Years	Sex	Hb gm./100 ml.	RBC million/cmm.	PCV %	MCV μ^3	MCHC %
0·6–4		10·8 } 11·5	4·1	32	79	33
5–9		11·5	4·1	33	80	34
10–14		12·5	4·5	37	82	34
Adults	Male	14	4·7	42	87	34
	Female	12	4·0	35	87	34
	Pregnant Female	10	3·3	29	87	34

[There is a misleading misprint in the report and what should read MCV μ^3 is given as MCH mm^3.]

The report deals in some detail with the techniques used in the surveys of populations for anaemia. For field work where personnel, space and equipment are limited, four simple procedures can be used: haemoglobin estimation, haematocrit determination, erythrocyte count, and examination of the stained smear. Of these, determination of the haemoglobin level and of the haematocrit are considered the most objective and acceptable. When accurate haemoglobin estimation is not practicable the specific gravity method offers distinct advantages. In particular, in surveys where the primary aim is the rapid assessment of the number of anaemic persons, it may only be necessary to use one bottle of copper sulphate solution of suitable density. When even the specific gravity method cannot be used it may be necessary to resort to the Tallqvist method, but it must be remembered that this is subject to considerable errors.

Where it is difficult to collect 1 ml. of blood for the estimation of the haematocrit by the Wintrobe method the microhaematocrit method in which capillary blood is used will give reliable results. If a standard centrifuge is not available the capillary tubes can be centrifuged on a simple car ventilator fan, run from a battery. The distance from the centre of the shaft to the bottom of the haematocrit tube should be 22·5 cm., the speed 3,000 r.p.m. and the time of centrifuging 35 minutes.

The sampling of a population for anaemia surveys should be carefully planned and wherever possible those competent in planning the valid sampling of a population should be consulted. In view of the fact that pregnant and lactating women, and infants and young children, are particularly vulnerable, a survey of these groups provides a ready but weighted indication of the magnitude of the anaemia problem.

The amount of dietary iron absorbed depends on many factors, some of which are:

(1) the reduction of ferric to ferrous iron,
(2) intestinal upset such as diarrhoea and steatorrhoea,
(3) quality and quantity of diet,
(4) iron content of diet,
(5) infections—interference with iron absorption and the use of absorbed iron for haemoglobin synthesis,
(6) state of iron stores—on the whole the lower these are the more efficient is the intestinal absorption,
(7) state of protein nutrition—the exact role has yet to be determined.

In temperate climates the total iron loss is 0·5–1·0 mgm./day in faeces, urine and sweat. Pregnancy, and particularly repeated pregnancy, menorrhagia and lactation constitute an important drain on the iron reserves. Of the excessive losses of iron in the tropics those caused by hookworms are the most important. Faecal losses in infected persons have been found to be as great as 10 mgm./day. Blood losses per worm are more severe in infections with *Ancylostoma duodenale* than in those with *Necator americanus*.

It is difficult to standardize iron requirements. This involves (1) determination of what is sufficient to meet the usual, physiological stresses, and (2) provision of additional iron to meet non-physiological losses. Where parasitism associated with blood loss is not endemic, increasing the food intake above existing levels may suffice to prevent iron deficiency anaemia. In areas where such parasitic infection is a major problem, it is probable that the enrichment of food with inorganic iron will also be necessary. In temperate climates normal men and women require respectively 10 and 12 mgm. per day. For women the daily need increases in the second half of pregnancy and during lactation to 15 mgm. per day. In infants and children the daily requirements are stated to be as follows:

below 6 months	5 mgm.
7 months to 3 years	7 mgm.
4–6 years	8 mgm.
7–9 years	10 mgm.
10–12 years	12 mgm.
13–19 years	15 mgm.

In the prevention of iron deficiency anaemia several approaches are possible: improvement of dietary habits, control of parasites, fortification of foods, prophylactic iron medication. This involves such different steps as the encouragement of practices such as cooking in iron containers which contributes significantly to the iron content of the diet, and the discouragement of other practices such as discarding of the water in which food has been cooked. Control or elimination of underlying disease, particularly of hookworm infection, is highly desirable. Enrichment of food must be carefully planned, and the food to be selected must be decided upon locally. Rice and other cereals, milk powder, vegetable protein concentrates, fish meal, salt and occasionally sugar may all be considered for fortification. In Mauritius addition of 6·6 mgm. of iron administered in the form of ferrous sulphate on 5 days per week resulted in significant increases in haemoglobin levels. It must always be remembered that improvement of diets must not be

restricted to iron alone, and that programmes should be directed to an overall raising of the quality of the food, particularly with respect to protein.

H. Lehmann

RAO, B. R. H., RAO, P. S. S. & BAKER, S. J. **General Health and Nutritional Survey of the Rural Population in Pennathur. Part VI. Iron Intake and Iron Deficiency Anemia.** *Indian J. Med. Sci.* 1959, July, v. 13, No. 7, 584–92. [29 refs.]

This survey of the population of a village near Vellore, South India, reveals once again the pattern of iron-deficiency anaemia that is so common in the Indian countryside—fairly severe hypochromic anaemia in the children and married women and mild anaemia in men, arising on a background of dietary iron intake that is on its face value not seriously inadequate. For example, the modal Hb levels were: for men, over 12 gm./100 ml., for women 11·0 to 11·9 gm./ml., and for children (ages not specified) 10·0 to 10·4 gm./100 ml. The mean iron intake, determined by food sampling, was 16·81 mgm. per head per day. Hookworm infection was present in 44·6% of the population, "but there was no correlation between the hemoglobin levels and the number of people infested with hookworm". No other significant correlations were established, the article being intended to draw attention to the frequency of anaemia, and its prevention by available vegetable foods and the use of iron in childhood and pregnancy.

[For early parts of this study see this *Bulletin*, 1959, v. 56, 964.]

Alan B. Raper

NATURE. 1959, Oct. 24, v. 184, 1291–3. [14 refs.] **Glucose-6-Phosphate Dehydrogenase and Human Erythrocytes. [i] Characteristics of Glucose-6-Phosphate Dehydrogenase from Normal and Primaquine-Sensitive Erythrocytes** [KIRKMAN, H. N.], 1291–2. **[ii] Mechanism of Inactivation of Glucose-6-Phosphate Dehydrogenase in Human Erythrocytes** [CARSON, P. E., SCHRIER, S. L. & KELLERMEYER, R. W.], 1292–3, 1 fig.

ALLISON, A. C. **Recent Developments in the Study of Inherited Anemias.** *Eugenics Quart.* Baltimore. 1959, Sept., v. 6, No. 3, 155–66, 2 figs. [Numerous refs.]

After the discovery of the sickle-cell haemoglobin there have been in the last 10 years three lines along which major progress has been made. (1) Widespread application of filter paper electrophoresis has led to the recognition of more than 30 varieties of human adult and 3 varieties of human foetal haemoglobin. (2) The nature of the mutational change in the abnormal haemoglobins has been traced in some of them to the replacement of one amino-acid residue by another in each half molecule of globin. The half molecules themselves have been shown to consist of two unequal polypeptide chains which are under independent genetical control. (3) The high incidence of the sickling gene which persists in spite of sickle-cell anaemia has been seen to be the outcome of a balanced polymorphism by which the heterozygotes for the normal and sickle-cell haemoglobin genes are favoured in their survival in areas where malignant malaria occurs, in comparison with both normal and abnormal homozygotes.

Hereditary anaemias due to other abnormalities than those of the globin have been discovered. Some of these are due to a deficiency of the red cell enzyme glucose-6-phosphate dehydrogenase. Deficient cells are likely to lyse when drugs such as pamaquine are administered or when the fava bean is ingested (favism).

In addition to constituents of the red cells the serum proteins are now being recognized to be polymorphic in character. Of these the haptoglobins combine with haemoglobin and help to prevent haemoglobinuria when haemolysis occurs. Other genetically determined serum proteins which are polymorphic are the transferrins which combine with iron. *H. Lehmann*

CHARLES, L. J. & SUITTERS, B. T. **Hereditary Eliptocytosis in Two Nigerian Families.** *West African Med. J.* 1959, June, v. 8 (n.s.), No. 3, 102–13, 3 figs. [43 refs.]

In the course of field investigations 1,677 blood samples were examined for the sickle-cell trait; these were principally derived from 9 villages in a forest area south of Agege, a market town approximately 20 miles northwest of Lagos in Nigeria. On two occasions, once in a 10-year-old boy, and once in a schoolmistress, more than 80% of the erythrocytes were seen to be elliptical in shape. 14 relatives in three generations of the first and 31 in three generations of the second were examined and in each family 4 further cases of elliptocytosis were encountered. On two occasions elliptocytosis and the sickle-cell trait were found together. *H. Lehmann*

PUNTONI, V. Il centro della microcitemia e la profilassi del morbo di Cooley. **[The Microcythaemia Centre and the Prophylaxis of Cooley's Disease]** *Ann. d. San. Pubblica.* Rome. 1959, July–Aug., v. 20, No. 4, 655–71, 4 maps.

The English summary appended to the paper is as follows:

"The author, after a short description of the present day pathogenetic notions of Cooley's disease, reports on the establishment of the national Center of microcythemia directed by Prof. Silvestroni, associated with the Institute of Hygiene of the University, with grants from the Ministry of Health.

"The results of the scientific and social work performed by Profs. Silvestroni and Bianco during 17 years of laboratory and social researches are described.

"The author stresses the importance of control methods in the absence of curative therapy, pointing out that the fight against Cooley's disease must be carried out through prophylaxis by identifying the patients affected with microcythemia as well as by widely propagating the belief that cases of Cooley's disease always issue from parents both affected with microcythemia."

GRELIER, L. J. & ROGE. Drépanocytose des habitants de la côte sud-est de Madagascar. **[Sicklaèmia in the Peoples of South-East Madagascar]** *Arch. Inst. Pasteur de Madagascar.* 1959, v. 27, 75–8.

The authors examined children of school age, belonging to various tribes in south-east Madagascar. Sickling preparations were made by moist stasis in

348 cases, and by using metabisulphite in 561. The latter method gave uniformly higher results in each locality, the overall rates for the two methods being 10% and 14·8% respectively, with a combined sickling rate (which is evidently too low) of 12·85%. A blood film from each child was examined for sickle cells, parasites, and other abnormalities. It is stated, without documentation, that 3 cases of sickle-cell anaemia were discovered. Splenic and malarial parasite indices were recorded for children aged 2 to 10 years.

Only one trustworthy fact emerges from this survey; this is that the general sickling rate in children in this part of Madagascar is somewhat above 12·85%. Several other tentative conclusions reached do not follow from the data presented. These are: (1) That the different tribal groups examined show different sickling rates. Among the groups supplying over 100 children in the survey, even the largest difference (17·5% for 148 Antaimoro and 10·8% for 258 Tanala) does not reach a technical level of significance. (2) That sickle-cell anaemia is rare. The methods used were quite inadequate to demonstrate this, though it may well be true. (3) That there is no marked antagonism between sicklaemia and malaria. This conclusion derives from the splenic and parasite indices in children over the age of 2 years in the 5 main tribal groups, whose sickling rates, as noted above, are not significantly different. It has been amply demonstrated in the past that much more sensitive methods of analysis are needed before conclusions under this head can be reached.

[See also this *Bulletin*, 1958, v. 55, 208.] *Alan B. Raper*

INGRAM, V. M. **Abnormal Human Haemoglobins. III. The Chemical Difference between Normal and Sickle Cell Haemoglobins.** *Biochim. et Biophys. Acta.* 1959, Dec., v. 36, No. 2, 402–11, 5 figs. [17 refs.]

"Tryptic digests of normal human and sickle cell haemoglobins contain a peptide fragment (peptide 4) which apparently alone of all the peptides has a different chemical structure in the two haemoglobins. This peptide has been degraded and its amino acid sequences have been determined in the two cases. The sole alteration is the replacement of a glutamic acid residue of normal haemoglobin by valine in sickle cell haemoglobin."

RAY, R. N., CASSELL, M. & CHAPLIN, H., Jr. *In vitro* **and** *in vivo* **Observations on Stored Sickle Trait Red Blood Cells.** *Amer. J. Clin. Path.* 1959, Nov., v. 32, No. 5, 430–35, 3 figs. [22 refs.]

"1. Five hundred milliliters of blood were drawn from each of 6 sickle cell trait donors and stored under conventional blood bank conditions.

"2. Interval observations of cell swelling, osmotic fragility, and concentrations of plasma potassium and haemoglobin during 28 days of storage were comparable to well-established findings for stored cells that lack the sickle trait.

"3. *In vivo* survival studies revealed normal immediate survival of 21-day stored sickle trait cells, 84 per cent. 24-hr. survival of the cells, and a normal disappearance of the surviving cells over the 28 days following transfusion, without evidence of increased splenic sequestration of destroyed cells."

CHARMOT, G. & REYNAUD, R. Anémie drépanocytaire avec paraplégie spasmodique, sidérose hépatique et altérations osseuses. Nouvelle observation. **[Sickle-Cell Anaemia with Spasmodic Paraplegia, Hepatic Siderosis and Bony Changes. Report of a Case]** *Bull. Soc. Méd. Afrique Noire Langue Française*. Dakar. 1959, v. 4, No. 3, 231–5. [13 refs.]

i. DOS SANTOS, W. D. & LEHMANN, H. **Acetazolamide in Sickle-Cell Anaemia.** *Brit. Med. J.* 1959, Aug. 8, 139–40.

ii. MACDOUGALL, Lorna G. & JACOB, Gillian. **Acetazolamide in the Treatment of Sickle-Cell Anaemia.** *Ibid.*, 141.

These two papers record experiences in the treatment of sickle-cell anaemia suggested by HILKOVITZ [this *Bulletin*, 1957, v. 54, 1350]. In no case could the observers confirm that acetazolamide had any beneficial effect.

i. In the first paper the authors in Lagos combined the drug treatment (in a dose of 7 to 24 mgm./kgm. daily) with the administration of large amounts of $NaHCO_3$ and KC1 to combat the metabolic acidosis, but found that this result could not be achieved. Treating 11 patients over a period of 2 weeks, they observed no constant change in the haemoglobin level, except in 2 patients in whom treatment coincided with the onset of a crisis, and in these the Hb fell. There was a tendency for the percentage of sickled cells to fall during the treatment, but the impression gained was that the drug had little effect on the anaemia during its rather brief trial.

ii. These authors treated 3 children in Nairobi, using the recommended dosage of 7 mgm./kgm. per day, over periods of from 6 to 35 days. In each case the anaemia increased, in the first case despite transfusion, in the second during a supervening attack of measles; while in the third case, treated at the onset of a crisis, it was necessary to resort to blood transfusion.

[See also this *Bulletin*, 1959, v. 56, 1182.] *Alan B. Raper*

RAMOT, B., SHEBA, C., FISHER, S., AGER, J. A. M. & LEHMANN, H. **Haemoglobin H Disease with Persistent Haemoglobin "Bart's" in an Oriental Jewess and her Daughter. A Dual Alpha-Chain Deficiency of Human Haemoglobin.** *Brit. Med. J.* 1959, Dec. 5, 1228–30, 2 figs. [15 refs.]

In a 40-year-old Jewess from Baghdad, Hb H disease was discovered, presenting in the usual way as a hypochromic anaemia. Suitable electrophoretic methods demonstrated, as well as normal adult haemoglobin, Hb H 5%, Hb "Bart's" [this *Bulletin*, 1958, v. 55, 936] 8%, and Hb A_2 1%. From 3·5 to 5·7% of the whole Hb was alkali-resistant, a result that could be attributed to the Bart's fraction, though there were faint traces of Hb F on resin chromatography. The patient's sister showed haematological changes suggestive of thalassaemia. 2 of the patient's children were normal, one showed 3·16% of Hb F as the only abnormality, while the fourth showed pathological and electrophoretic findings closely similar to those of her mother.

The interest in this family lies in the following considerations. Two different polypeptide chains (alpha and beta) enter into the formation of the Hb A molecule, while Hb H consists of the beta chain only. Foetal Hb contains another pair of chains (alpha and gamma), while Hb Bart's consists of gamma chain only. Thus Bart's in infants is the analogue of H in adults, each being the normal molecule without the alpha chain, and it

might be expected that a single defect (failure of alpha-chain production) would cause the appearance of Hb Bart's in an infant and Hb H in adult life. But this sequence of events has not been observed; and one explanation advanced is that alpha-chain production in the foetus is not under the same genetic control as in the adult. Against this hypothesis of dual control for the alpha chain, the authors point out that none of the 4 children of their propositus inherited Hb H or Hb Bart's separately, while one inherited the same combination as the mother; and also that alpha-chain deficiency is evident (though to a different degree) in both the adult and the foetal elements in the patient's haemoglobin.

If the alpha-chain deficiency, affecting both adult and foetal forms of the molecule, is indeed the outcome of a single cause, why have not Hb H and Hb Bart's been found in combination before? The authors think that the reason may lie in technical difficulties, and they expect that the combination will be found more frequently in the future. *Alan B. Raper*

VELLA, F. **Heterogeneity of Human Foetal Haemoglobin: Incidence of Foetal Variants in Singapore.** [Correspondence.] *Nature*. 1959, July 25, v. 184, Suppl. No. 5, 272–4, 3 figs. [10 refs.]

Three variants of foetal haemoglobin have been described which differ from haemoglobin F in their electrophoretic mobility. One moves at alkaline *p*H more slowly than haemoglobin F (and A) and two move faster. The first has been named the "Alexandra" type, and the other two have been described respectively as the haemoglobin of "Fessas and Papaspyrou" (F & P) [this *Bulletin*, 1958, v. 55, 444] and haemoglobin "Bart's" [*ibid*., 1958, v. 55, 936].

The author obtained 2,517 samples of cord blood from the Kandang Kerbau Maternity Hospital and the British Military Hospital in Singapore. On paper electrophoresis minor haemoglobin fractions could be seen in many of them. In the majority of cases these were too small to be detected by visual inspection of the unstained paper, but they could be demonstrated by staining with benzidine. Their electrophoretic mobility corresponded to haemoglobins Alexandra and F & P. The incidence of visually dectectable haemoglobin fractions other than A and F in unstained electrophoretograms is summarized in the following Table.

Ethnic group	Number examined	Alexandra	F & P	Bart's
Chinese	1,962	8	63	2
Malay	162	2	2	—
European	142	1	1	—
Indian	222	—	2	—
Eurasian	10	1	—	—
Nepalese (Gurkha)	19	—	—	—
Total	2,517	12	68	2

The author suggests that haemoglobins Alexandra and F & P are normally present in cord blood rather as the haemoglobin A_2 and A_3 fractions are

present as small components in adult blood. They would be raised in concentration when haemoglobin F formation is decreased. One case of an anaemic baby with an unusually high level of haemoglobin F & P is described in detail. Haemoglobin Bart's would however be a truly abnormal foetal haemoglobin and would correspond in the foetal series to adult variants such as haemoglobins S, C etc. *H. Lehmann*

DHERTE, Paulette, LEHMANN, H. & VANDEPITTE, J. **Haemoglobin *P* in a Family in the Belgian Congo.** *Nature*. 1959, Oct. 10, v. 184, 1133–5, 4 figs. [12 refs.]

2 of 1,000 pregnant women examined in Stanleyville were found to possess haemoglobins A + P. Examination of the family of one of these women revealed Hb S in 7 of the 20 members available, and resulted in the discovery, in one brother, of a mixture of haemoglobins A + P + S, together with 4% of Hb F. By a phenotypically normal wife this man had 6 living children, 3 of whom were of A + S, and 3 of A + P haemoglobin constitution.

Haemoglobins S and C have been shown to be determined by allelic genes, whereas at least 3 other adult Hb variants are controlled from some other locus. From the study of this family, "It seems that haemoglobin *P* joins the group of adult variants whose inheritance could be interpreted as being under different control from that responsible for haemoglobins *S* and *C*". The authors explored this possibility further. Taking account of the hypothesis that 2 non-allelic genes for haemoglobin formation could find independent expression if they affected separately the two polypeptide chains of the Hb molecule, they attempted to achieve dissociation and recombination of the chains in a natural mixture of A + P + F from the propositus. This manoeuvre should have produced at least one new "hybrid" haemoglobin. It appeared in fact to have done so, but no other new "hybrids" could be found when Hb S or C was introduced into the reacting mixture. This was explained by supposing that their characteristic chains formed much less stable hybrids with P chains than those formed between P and F chains. *Alan B. Raper*

VENOMS AND ANTIVENENES

DE MAGALHÃES, O. Campanha antiofídica em Minas Gerais. [**The Campaign against Snakes in Minas Gerais, Brazil**] *Mem. Inst. Oswaldo Cruz*. 1958, Dec., v. 56, No. 2, 291–372, 21 figs. & 1 folding map. [33 refs.]

The English summary appended to the paper is as follows:—

"The author describes the phases of the antiophidian campaign in Minas Gerais (1918 to 1940). He registers the following species of poisonous snakes found:

Bothrops cotiara
Bothrops alternata
Bothrops atrox

Bothrops neuwiedii
Bothrops jararaca
Bothrops inaequalis
Bothrops jararacussú
Crotalus terrificus terrificus
Lachesis mutus
Micrurus lemniscatus
Micrurus frontalis
Micrurus corallinus

and numerous species not poisonous, making a map for the geographical distribution of the poisonous snakes in Minas Gerais. He verified that the species of the genus *Bothrops*, and not of the genus *Crotalus*, predominate in the State. He registers morphologic differences principally in size of the *Crotalus terrificus terrificus* of the North of the State and of the Centre and South. He relates two cases of a certain gravity of persons allergic to ophidian poison, liquid or dry; they were cured by being removed from the work of the snakes department of the Instituto Ezequiel Dias. He also registers, in 22 years of work, numerous observations on the bites of poisonous and non-poisonous snakes, the latter without gravity. Of the first, 984 observations were of human cases and of these 531 took serum with a mortality rate varying from 7·6 to 100% of the cases, according to the period and the kind of snakes; the general average death rate being 33%. No case of *Lachesis mutus* recovered."

MARX, H. **Review of the Colubrid Snake Genus** *Spalerosophis*. *Fieldiana: Zool.* 1959, May 22, v. 39, No. 30, 347–61, 1 map & 2 figs. [15 refs.]

BERTHOLD, G. Acerca de una modificación del veneno crotálico y de sus efectos. [**A Modification of** *Crotalus* **Venene and its Effects**] *Gac. Méd. de Caracas*. 1958, July–Dec., v. 67, Nos. 7/12, 59–67, 3 figs.

GITTER, S., DE VRIES, A. & KOCHWA, S. **Recent Studies on the Venom of** *Vipera xanthina palestinae*. *Israel Med. J.* 1959, Jan.–Feb., v. 18, Nos. 1/2, 10–21. [52 refs.]

BEHAR, M. **Radiculoneuritis due to Antivenom Serum Treatment after Snake Bite.** *Israel Med. J.* 1959, Jan.–Feb., v. 18, Nos. 1/2, 22–5. [18 refs.]

"A case is described of a patient who was bitten by a Vipera xanthina palestinae and who, following treatment with antivenom serum (anti-vipera lebtina, Institut Pasteur) developed radiculoneuritis 10 days later.

"This clinical picture is considered to be a reaction to serum treatment, without any connection whatsoever with the venom itself or with its antigenic properties."

ROBOZ, L. Mordeduras de serpientes. Estudio clínico patológico y apuntes sobre su tratamiento. [**Clinical and Pathological Studies on Snake Bites with Observations on Treatment**] *Acta Méd. Costarricense.* 1959, May–Aug., v. 2, No. 2, 134–8.

The English summary appended to the paper is as follows:

"The different species of poisonous snakes found in the southern part of Costa Rica are classified and described. The general symptomatology of the poisoned victims from snake bites is illustrated. Various medical treatments are suggested which have been applied in more than 80 cases of snake bites, most of them personally treated by the author."

RUSSELL, F. E. **Stingray Injuries.** *Pub. Health Rep.* Wash. 1959, Oct., v. 74, No. 10, 855–9, 1 fig. [17 refs.]

Stringrays frequent the coastal waters of the U.S.A. both on the Atlantic and Pacific shores, where they attack some 750 persons a year who step on them while fishing or bathing [this *Bulletin*, 1953, v. 50, 556]. Of 1,097 such injuries reported over 5 years, 232 came under medical care, of whom 62 required hospital treatment, though 10 of these had suffered more from enthusiatic first-aid treatment than from the original injury. There were 2 deaths in this series.

The weapon of the stingray is a doubly-serrated, curved spine situated on the dorsal aspect of the tail near its mid-point. The number and location of these spines vary with species and age. Before attack the spine is enclosed in a sheath and contains venom in 2 ventrolateral grooves. During insertion into a victim the sheath is torn off and often remains to contaminate the wound.

The wound caused by the violent upward lash of the tail is usually lacerated and contaminated by fragments of the sheath as well as by venom, which exerts both local and general effects. The venom is a complex protein substance which is very thermolabile. It has an estimated LD50 of 28 mgm. per kgm. of body weight. When injected experimentally into cats at a low concentration it causes peripheral vaso-constriction or vaso-dilatation and a degree of sinu-auricular block. Higher concentrations produce generalized vaso-constriction, auriculo-ventricular block and sinus arrest. There is evidence of myocardial ischaemia and even necrosis. The blood pressure falls and death may occur acutely in cardiac arrest; in animals which survive, the effects, except for the myocardial damage, pass off within 24 hours.

In the human victim, stinging is followed by immediate and intense local pain, then by nausea and syncope and sometimes by diarrhoea and vomiting. Respiratory distress, arrhythmias, paraesthesiae and convulsions have been reported. The site of injury presents as a lacerated wound with oedematous and necrotic edges, in which may be seen fragments of the sheath of the spine.

First-aid treatment calls for immediate irrigation with sea water and the application of a [?venous] tourniquet. The wound should then be immersed in water heated to the limit of toleration for 30–90 minutes. As soon as possible formal surgical debridement and suture should be carried out, and the limb should be elevated and immobilized. Anti-tetanus prophylaxis should be given, together with an antibiotic.

The most dangerous injuries are those which penetrate the peritoneal or

pleural cavities and these require full and careful laparotomy at the earliest possible moment.

The article is illustrated by a fascinating case history 350 years old. Capt. John Smith, of the English Colony of Virginia, in June 1608 explored Chesapeake Bay in a boat, accompanied by a physician, Dr. Walter Russell. Discovering a number of fish lying in shallow water he disported himself by transfixing them with his sword until he attacked a stingray which retaliated by stinging him on the wrist. His immediate symptoms were so severe that "all with much sorrow concluded his funerall, and prepared his grave in an Island, by, as himselfe directed". Dr. Russell claims to have saved his life by the application of a "precious oyle" [the composition of which remains a professional secret] and recovery was complete after he had eaten the flesh of the fish the same evening. *J. H. Walters*

TOXOPLASMOSIS

Mousa, A. H. & El-Rooby, A. **Toxoplasmosis. Report of a Case in Egypt.** *J. Egyptian Med. Ass.* 1959, v. 42, Nos. 4/5, 321–31. [15 refs.]

Stirling, G. A. & Dixon, H. G. **Congenital Toxoplasmosis in a Jamaican Child.** *West Indian Med. J.* 1959, June, v. 8, No. 2, 124–7, 2 figs. on pl. [17 refs.]

Ferrara, A., Orlandella, V., Santoro, E. & Andrini, F. Su di una particolare forma di polmonite protozoaria. Osservazioni sperimentali sulla polmonite toxoplasmosica. [**A Special Form of Protozoal Pneumonitis. Observations on Toxoplasmic Pneumonitis**] *Giorn. di Malattie Infettive e Parassit.* 1959, May, v. 11, No. 5, 330–51, 32 figs. [Numerous refs.]

In adult human beings there occurs a special form of toxoplasmosis characterized by a typical pneumonitis, comparable to that observed in infected dogs. In order to throw light on this obscure condition, the authors have carried out an investigation of the pulmonary lesions found in mice, guineapigs and rabbits infected with *Toxoplasma*. From these observations, which are described in great detail and are illustrated by numerous photomicrographs depicting the histopathological changes, the authors have arrived at the following conclusions.

The toxoplasms have a special predilection for the lungs, which are invariably invaded by them, irrespective of the route of inoculation. The structure of the pulmonary lesions varies according to the species of host, its age, the route of inoculation, the effect of drugs used, and the duration and course of the disease. The most marked changes, manifested by acute bronchopneumonia with numerous lesions, follow inoculation of the parasites into the respiratory tract. In typical lesions, when the lungs are invaded *via* the blood stream, the parasites are at first found within the endothelial cells of sinusoids and later in histiocytes and cells of the alveolar epithelium. There is progressive

loss of cells in the septa and homogenization of its structure, with ischaemia and haemorrhages. However, there are no signs of inflammatory or exudative reactions. As the result of the intracellular development of the parasites, cytolytic as well as proliferative and metaplastic phenomena constitute the most characteristic changes in toxoplasmic pneumonitis. The lesions in question differ in a number of characters from pulmonary changes produced by viruses, rickettsiae and *Pneumocystis*. Since toxoplasmic pneumonitis is characterized by pathological changes affecting the structure of the septa rather than that of the interstitial spaces, it is suggested that it should be known as "septal pneumonitis". *C. A. Hoare*

MINTO, A. & ROBERTS, F. J. **The Psychiatric Complications of Toxoplasmosis.** *Lancet.* 1959, June 6, 1180–82. [12 refs.]

There are two reports in the literature, here referred to (*Nervenartz*, 1950, v. 14, 161; *Arch. Psychiat. Nervenkr.*, 1955, v. 193, 38), of proved infection with *Toxoplasma gondii* presenting as an acute schizophrenic-like illness; and to these a third is now added.

The patient presented when 22 years old but had had severe meningitis at the age of 6 weeks and, following this, fits until soon after starting school at the age of 5 years. She had been backward and a poor scholar and after leaving school had many domestic jobs which she had kept only for short periods. She presented shortly after her father's death which had been followed by restlessness, anxiety and a paranoid state necessitating her admission. She then complained of headache and a sore throat, she became pyrexial and an urticarial rash was present on the arms and legs. She lay immobile in bed, resentful of all attention and out of touch with her surroundings in a manner suggesting catatonic schizophrenia. The white cell count was 15,000 per cmm. blood, and investigations for typhoid, paratyphoid, brucellae and tubercle bacilli were negative. Her mental state was not improved by electroconvulsive therapy or by insulin therapy and she left hospital after 5 months with a diagnosis of catatonic schizophrenia. She was readmitted 4 months later in an elated and overactive state but discharged herself against advice after 3 weeks and was readmitted 2 months later. She then complained of difficulty in seeing but was orientated and there was no evidence of schizophrenic thought processes. In the optic fundi there were areas of long standing choroido-retinitis, with numerous minute scattered lesions and in the right eye there was a lesion about the size of the optic disk. These were thought to be congenital; the maculae were normal. The Sabin-Feldman dye test for toxoplasmosis was positive at a titre of 1 in 16 but the toxoplasma complement-fixation test was negative. A diagnosis of toxoplasmosis with behaviour disorder was then considered and the patient was treated with sulphadimidine 1 gm. every 6 hours and pyrimethamine 25 mgm. twice daily for 10 days.

It was considered that the dye test titre of 1 in 16 was compatible with a long-standing toxoplasma infection but not diagnostic of it. The diagnosis was, however, supported by the choroido-retinitis, the history of fits, abnormal electro-encephalographic tracings, mental retardation, the recent pyrexial illness and its association with an urticarial rash similar to that which has been reported as a manifestation of the infection in adults. It was therefore

considered likely that the patient had congenital toxoplasmosis with an exacerbation in adult life which had given rise to a transient schizophrenic episode. *A. W. Woodruff*

LAINSON, R. **A Note on the Duration of *Toxoplasma* Infection in the Guinea-Pig.** [Miscellanea.] *Ann. Trop. Med. & Parasit.* 1959, Apr., v. 53, No. 1, 120–21.

A guineapig, which recovered from an acute infection with *Toxoplasma*, was killed 5 years after the original inoculation. Suspensions of its brain, when inoculated into mice, produced acute and fatal infections in them, whereas inoculation of lung suspensions into other mice failed to infect. Sections of the brain revealed several toxoplasma cysts, measuring 30–40 μ, but none was found in sections of other tissues. It is noted that the virulence of the parasites remained unchanged after remaining in the guineapig brain for 5 years and that the size of the cysts corresponded to that in animals infected for only 3–4 months, having presumably reached their maximum dimensions after a few months' growth. [See also this *Bulletin*, 1951, v. 48, 1150; 1958, v. 55, 572.] *C. A. Hoare*

DERMATOLOGY AND FUNGUS DISEASES

See also p. 261, HUNTER, **"Swimmer's Itch" in Colorado.**

RODRÍGUEZ M., J. D. Revisión de las micosis profundas in Ecuador. [**Review of Deep Mycoses in Ecuador**] *Rev. Ecuatoriana de Hig. y Med. Trop.* Guayaquil. 1958, Oct.–Dec., v. 15, No. 4, 177–88, 8 figs. [17 refs.]

The author reviews the records of deep mycosis recorded in Ecuador, with special reference to the last 10 years, during which time special mycological studies were made.

Findings are discussed of South American blastomycosis, histoplasmosis, cryptococcosis, chromomycosis, rhinosporidiosis, actinomycosis and nocardiasis, with references to the areas of the country in which they were found. The presence of coccidioidomycosis is suspected on clinical and immunological evidence, but the organism has not been isolated. For many of these mycoses, the number of cases recorded is very small, but it is suggested that continued mycological study will reveal a larger number. Notes are given on several individual cases and the appearances of some of them are illustrated in 8 photographs.

South American blastomycosis is evidently present both in the humid coastal areas and at the higher altitudes: histoplasmin tests have indicated that histoplasmosis is to be found in all the provinces of the coastal area: the suspected cases of coccidioidomycosis were found in the Quito region: incidence could not be assessed in the case of other mycoses, owing to the small numbers seen.

H. J. O'D. Burke-Gaffney

LATAPÍ, F. Micetoma. Analisis de 100 casos estudiados en la ciudad de México. [**Study of 100 Cases of Mycetoma in Mexico City**] Reprinted from *Mem. III Congreso Ibero Latino Americano de Dermat.* Mexico. 1959, 203–13, 17 figs. [21 refs.]

The author, who is Professor of Dermatology in the University of Mexico, reviews the mycetomas, with special reference to their occurrence in Mexico, where the number of cases annually between 1947 and 1956 varied between 2 and 21. He then discusses 100 cases seen during that period in the dermatology department of the General Hospital in Mexico City. All but 2 cases were due to *Nocardia brasiliensis* and this is in accord with the usual experience of Mexican authors. Some 60% to 70% of patients came from Michoacán, Guerrero, Veracruz and Morelos, predominantly tropical areas, though several cases originated in more temperate areas. 62% occurred in persons working in rural areas and 81% were men, mostly aged 20 to 50 years. The distributions are shown in a map and in figures. 75% of lesions were localized on the lower limbs (the exact positions are shown in a figure). Clinical and mycological aspects and diagnosis are discussed.

Since 1947 the author has been using sulphones and later isoniazid or streptomycin in the treatment of mycetoma. He sets out the treatment used in the case of the present 100 patients. For various reasons, which are given, 36 patients received no or only initial treatment; 13 others had surgical treatment. 33 received sulphones and of these 15 were stated to be cured clinically after a year, 10 are showing various degrees of progress, 6 have been lost sight of and only 2 are regarded as failures of treatment.

Of the remaining patients 7 had isoniazid and 2 have been recorded as cured clinically: the remainder had various treatments, with varying results.

H. J. O'D. Burke-Gaffney

BATTISTINI, F., BRICEÑO-MAAZ, T. & DE BRICEÑO-MAAZ, Clara. Caso de pie de madura producido por el *Monosporium apiospermum.* [**A Case of Madura Foot caused by** *Monosporium apiospermum*] *Gac. Méd. de Caracas.* 1958, July–Dec., v. 67, Nos. 7/12, 181–6, 3 figs.

NGUYEN-VAN-AI, NGUYEN-TRI-LOC, NGUYEN-VAN-UT & TRAN-NGOC-NINH. Mycétome rhinosporidien avec ostéite. Seconde note. [**Rhinosporidiosis with Osteitis**] *Bull. Soc. Path. Exot.* 1959, Mar.–Apr., v. 52, No. 2, 140–42, 8 figs. on 4 pls.

The authors describe a remarkable case in which a recurrence of lesions of rhinosporidiosis developed 2 years after a tumour had been excised from the nasopharynx. Apart from a recurrence at the original site, lesions were present at the wrist and on the foot and both of these involved bone.

This appears to be the first record of dissemination of *Rhinosporidium seeberi* to involve bone at multiple sites.

Peter Abbott

LAVALLE, P. Coccidioidomicosis en México. [**Coccidioidomycosis in Mexico**] Reprinted from *Mem. III Congreso Ibero Latino Americano de Dermat.* Mexico. 1959, 198–202, 7 figs. [32 refs.]

The author gives a brief introductory note on coccidioidomycosis and then refers to its incidence in various areas of Mexico, with reference to the literature.

Endemicity is more apparent in frontier zones, particularly in the north-west: some of these infections are traceable to returning casual labourers who had emigrated temporarily to the United States to help in harvesting: 2 such cases are described in which infection occurred in California. There are, however, also foci in more southerly areas of Mexico, such as in Colima and Michoacán: 2 apparently autochthonous cases are recorded from the latter area.

The author suggests that the increasing number of temporary labourers migrating to the United States may well result in an increase in the number of cases of coccidioidomycosis seen in Mexico when they return home.

H. J. O'D. Burke-Gaffney

CASTELLOT, J. J., PITTS, F. W. & MOWREY, F. H. **A Case of Coccidioidal Meningitis arrested by Prolonged Therapy with Intravenous Amphotericin B.** *Antibiotic Med.* New York. 1959, Aug., v. 6, No. 8, 480–85, 1 fig. [16 refs.]

Coccidioidal meningitis developed in a 21-year-old male after lobectomy for fibrocavitary disease. Daily intravenous infusions of amphotericin B, starting with a dose of 0·25 mgm./kgm. of body weight and increasing to 1·0 mgm./kgm., were given over a period of six and a half months—5·7 gm. in all—and led to apparent cure: the patient was well and free from symptoms more than 7 months after treatment.

Side effects of the drug, notably azotaemia and progressive renal dysfunction were encountered during treatment but happily disappeared after it was discontinued.

Peter Abbott

MACKINNON, J. E. Miositis en la blastomicosis sudamericana experimental. [**Myositis in Experimental South American Blastomycosis**] *An. Facul. de Med. Montevideo.* 1959, Jan.–Feb.–Mar.–Apr., v. 44, Nos. 1/2, 149–55, 12 figs.

The English summary appended to the paper is as follows:—

"The intravenous inoculation of the mouse with a suspension of the yeast-like form of *Paracoccidioides brasiliensis* produced an evolutive disease of a slow course, 1 to 6 months. Disseminated visceral lesions were always recorded and also a myositis of the striated muscles: myocardium (figs. 5, 6, 7 and 8) tongue (fig. 1) oropharyngeal, laryngeal, skeletal and perianal muscles. When the superficial muscles of the tongue are attacked cells of paracoccidioides are found also in the epithelium (figs. 2, 3 and 4).

"After inoculation in the peritoneum local lesions developed slowly. Twenty-five out of 41 animals showed pulmonary lesions (figs. 9 and 10). Thirteen mice showed hematogenous dissemination to several viscera and to striated muscles. All these 13 mice belong to the group with pulmonary lesions."

MACHADO, J., Jr. & MIRANDA, J. L. Sôbre a ação da sulfametoxipiridazina na blastomicose Sul-Americana. [**The Action of Sulphamethoxypyridazine in South American Blastomycosis**] *Rev. Brasileira Med* Rio de Janeiro. 1959, Mar., v. 16, No. 3, 168–70. English summary (5 lines).

This work relates to 13 male patients aged from 27 to 69 years, in whom the diagnosis of *Paracoccidioides brasiliensis* infection was made either by

direct microscopic examination of scrapings from ulcers, skin or mucous membranes, or by histological examination of tissue. The lesions were present in the mouth (12 patients)—on the gums, hard palate or lips—on the skin (2), and in the lungs. Glands were involved in 4 cases and the lungs in 10 (6 infiltrative and 4 nodular). The disease had lasted from 1 to 78 months; 9 patients had not previously been treated with other sulphonamides, but 4 had had these drugs for various periods.

Sulphamethoxypyridazine (Lederkyn, Lederle) is absorbed rapidly and excreted slowly; it was given in a dose of 0·5 gm. twice daily for 10 days and thereafter 0·5 gm. once daily. Results were good except in 2 cachectic patients with cor pulmonale, who died after only a few days of treatment. In 8 the oral lesions regressed to cicatrization in 15–45 days, and in 3 with skin lesions 2 were cicatrized in 30 days (the 3rd patient died). Glandular lesions regressed within 20 days, and of 6 patients with pulmonary infiltration 3 improved and 1 remained stationary and 1 died, of 4 with pulmonary nodules 3 improved and 1 died. The drug was well tolerated, though 2 patients showed skin reactions which required antihistamine drugs. The period of observation was up to 9 months, which is recognized as insufficient. *Charles Wilcocks*

CARMODY, E. J. & TAPPEN, W. **Blastomycosis Meningitis: Report of a Case successfully treated with Amphotericin B.** *Ann. Intern. Med.* 1959, Oct., v. 51, No. 4, 780–91, 5 figs. [25 refs.]

"A case of blastomycosis meningitis is reported in a 22 year old Negro male. The diagnosis was made by smear and culture of the spinal fluid. Treatment with amphotericin B was instituted with gradually increasing doses until a level of 75 mg. per infusion/day was attained. A total dosage of 2·65 gm. of the drug was administered to the patient over a 57-day period. The response was good, with gradual improvement in the spinal fluid and the clinical appearance of the patient. He has remained completely asymptomatic three months following discharge from the hospital, and is currently being followed up in the Outpatient Clinic.

"Although the post-treatment period is too short for any definitive conclusions, the patient's progress to date seems to warrant an optimistic view as to the success of this treatment."

EMMONS, C. W. & PIGGOTT, W., with the technical assistance of W. B. HILL, Jr. **Amphotericin B and Griseofulvin in the Treatment of Experimental Systemic Mycoses.** *Antibiotics & Chemotherapy.* New York. 1959, Sept., v. 9, No. 9, 550–56. [21 refs.]

In this paper the authors report the results of a series of experiments to test the therapeutic effect of amphotericin B on mice inoculated with suspensions of the causative agents of various systemic mycoses and also the results of a combined experiment in which the effect of this drug was compared with that of griseofulvin on these experimental infections.

In batches of 10 individuals for each pathogenic fungus mice were inoculated intravenously with the yeast phase of *Blastomyces dermatitidis* and *Histoplasma capsulatum* respectively, also with *Cryptococcus neoformans* and the arthrospores of *Coccidioides immitis*.

Amphotericin B was used in saline suspension and in "solubilized" form with sodium deoxycholate. The following experiments were carried out with this drug.

Experiment I. Crystalline amphotericin B (lot HV–569) in the amount of 1·0 mgm. per mouse (56 mgm. per kgm.) was injected intraperitoneally in 0·2 ml. saline commencing on the day after infection. A total of 35 daily injections was given, Saturdays and Sundays excepted. Control mice were left untreated.

Experiment II was conducted along mainly similar lines but for a shorter period.

Experiment III. 0·04 mgm. of solubilized amphotericin B (lot 7K 35270) per mouse in 0·5 ml. of 5% glucose was given intravenously (tail vein), commencing 3 days after infection and continued daily for a total of 14 doses, Saturdays and Sundays excepted. Control mice were injected with 0·5 ml. of 5% glucose on each treatment day.

Experiment IV. The amphotericin B was, for the sake of comparison with griseofulvin, diluted in 0·05% polysorbate 80 (Tween 80) in saline. The dose of this solubilized amphotericin B used was 0·025 mgm. (1·4 mgm. per kgm.) injected intravenously in the tail. Treatment was begun 3 days after infection and was given 3 times per week subsequently for a total of 10 treatments. Control mice were injected intravenously with 0·5 ml. of 0·05% polysorbate 80 in saline.

Results showed that on the average survival time was prolonged by administration of the drug in experiments I and II but not in the case of mice infected with *Histoplasma*. This exception is thought to be due to the toxic effect of the drug at the dosage in which it was administered. A few of the mice from each of the other groups infected with one of the other 3 fungi also died within a few days of the beginning of the experiment, probably for the same reason.

In experiment III survival time for mice infected with either *Blastomyces*, *Cryptococcus* or *Coccidioides* was prolonged, the dose being 0·04 mgm. per mouse (2·2 mgm. per kgm.), but not at the lower dosage of 0·025 mgm. per mouse (1·4 mgm. per kgm.).

Cultures made from the tissues of the infected mice treated with this drug showed that it had exerted a sterilizing effect on the tissues only of mice receiving the higher dosage of solubilized amphotericin B, *i.e.* 0·04 mgm. per mouse (2·2 mgm. per kgm.).

Griseofulvin, being insoluble in water, was triturated in saline containing 0·05% polysorbate 80, before administration, to improve the quality of the suspension. It was administered orally at 2 levels: at 10 mgm. and at 30 mgm. per mouse; intraperitoneally at 5 and 15 mgm. per mouse, and intravenously at 1 and 5 mgm. per mouse. The time schedule followed was that of experiment IV so that the results of treatment with the two drugs could be compared.

A further set of experiments in which several categories of controls were included was carried out to test the effect of griseofulvin administered to the mice when infected with the aforementioned fungi. In none of the tests carried out with this drug did the results indicate that it had exercised any therapeutic effect, either by sterilizing the tissues or by prolonging life in the presence of histoplasmosis, blastomycosis, cryptococcosis or coccidioidomycosis.

C. J. La Touche

RODRÍGUEZ, Obdulia. Cromoblastomicosis. Su tratamiento con calciferol. [**Treatment of Chromoblastomycosis with Calciferol**] Reprinted from *Mem. III Congreso Ibero Latino Americano de Dermat.* Mexico. 1959, 182–9, 8 figs. [44 refs.]

The author describes 3 cases of chromoblastomycosis in elderly male Mexicans whom he treated with calciferol [this *Bulletin*, 1955, v. 52, 299]. The lesions were situated respectively on the dorsum of the left foot, the left forearm and hand and the right gluteal region. Some photographs are given of lesions before and after treatment, of histological sections and of a culture of *Phialophora pedrosoi*, which was isolated from all 3.

In the first patient, calciferol in alcoholic solution was administered in massive doses of 600,000 units twice weekly for the first 6 months, once weekly for another 6 months and fortnightly for the last 6 months. Clinical and histological cure was obtained: this began after 3 months. In the second patient the same dose was given twice weekly for 10 months: improvement began after one month. The third patient received the same dose once weekly. He is still under observation, but signs of improvement were evident in the early months of treatment.

The author reviews the history, epidemiology, clinical, mycological and therapeutic aspects of chromoblastomycosis at some length, with reference to the literature. *H. J. O'D. Burke-Gaffney*

TROPICAL OPHTHALMOLOGY

HANNA, L., THYGESON, P., JAWETZ, E. & DAWSON, C. **Elementary-Body Virus isolated from Clinical Trachoma in California.** *Science.* 1959, Nov. 13, v. 130, 1339–40, 2 figs.

An agent belonging to the psittacosis-lymphogranuloma group was isolated from a 36-year-old white male Californian with clinical acute trachoma. It was seen in stained conjunctival smears and was established in the yolk sac of 8-day embryonated eggs by passage. By the third passage it was killing the embryo in 4 to 8 days; at the time of writing it had reached the 7th egg passage. 4 cynomolgus monkeys inoculated on the conjunctiva with the egg-grown virus developed follicular conjunctivitis. It was shown to contain the complement-fixing psittacosis-lymphogranuloma group antigen and antibody for this antigen was demonstrated in the patient's serum in the 6th week of disease. *S. P. Bedson*

TROPICAL ULCER

FERGUSON, A. L., BEEMER, A. M., BRODIE, A. & JACKSON, J. H. **Tropical Ulcer in Natal.** *South African Med. J.* 1959, Oct. 3, v. 33, No. 40, 830–34. [28 refs.]

Among the various factors held responsible for tropical ulcers are infection with Vincent's organisms, deficiency of protein, vitamins, essential fatty acids,

and calcium. Debility due to other illnesses and parasitic infections has also been blamed, while a high incidence of ulcers is often associated with a hot moist climate. Devitalization of the skin tissue either from trauma or endogenous factors would also appear to be a common predisposing cause.

Epidemics occasionally arise, and one is reported as occurring in 1958 among African schoolchildren and farm labourers in the Verulam District, Natal.

At the time of onset the climate was warm and moist, and malnutrition and parasitic infection were common among the patients. Many had unhealthy, spongy gums. A variety of organisms was found on direct smears and culture, including fusiform bacilli, spirochaetes, staphylococci, streptococci and coliform organisms. Direct contagion and infection from the mouths of children to the legs of those afflicted were blamed for the spread.

Treatment was by means of intramuscular injections of penicillin and dressings of eusol, followed, after a week, by an Elastoplast bandage. This usually produced cure in 4 to 6 weeks. *Harold Wilson*

MISCELLANEOUS DISEASES

COBBAN, K. McL. **Analysis of a Year's Outpatients at University College Hospital, Ibadan.** *J. Trop. Med. & Hyg.* 1959, June, v. 62, No. 6, 129–34.

At the new University College Hospital, Ibadan, Nigeria, a large general out-patient clinic has been provided which supplies the consultant clinics and the wards with suitable patients for teaching and in this paper the causes of morbidity among those attending this clinic are analysed.

Diagnoses were made in accordance with the 1948 edition of the International Statistical Classification of Diseases with modifications whereby a code of 300 terms was constructed allowing ready breakdown into disease groups. During the year under review (1957–58) there were 32,730 new patients and total attendances numbered 67,035. Towards the end of the first quarter it became impossible to see all the patients who crowded to the hospital and preliminary selection had to be carried out to ensure that no seriously ill patient was turned away; this changed slightly the picture of the pattern of morbidity encountered. More than 75% of all diagnoses made fell into 10 categories as follows:—gynaecological and obstetrical 11·1%, malaria 10%, respiratory diseases 11·7%, diseases of the digestive system and peritoneum 11·3%, symptomatic conditions 7·4%, skin and cellular conditions 8%, gastro-intestinal infections 5·5%, tuberculosis 6·1%, nutritional deficiencies 4% and helminthic infections 2·5%.

The number of respiratory diseases was augmented by an epidemic of Asian influenza and the diseases of the digestive system and peritoneum were increased by approximately one-third by inclusion of childhood cases of diarrhoea, not considered severe enough to be classified as gastro-enteritis. [Many would argue that any diarrhoea due to non-specific causes producing inflammation should be classified as gastro-enteritis and that severity of the diarrhoea is irrelevant to the issue.] Functional disorders of the stomach and intestine in adults accounted for 30% of the diseases in this group. Peptic ulceration was common, and accounted for 388 patients many of whom presented in a late

stage with marked pyloric stenosis. Approximately 40% of those with gynaecological disorders complained of infertility and no organic disease was found, although in many of those classified as infertile the condition was relative since they had already had one or more children.

Malaria was diagnosed 3,718 times, mostly on clinical grounds and children below the age of 10 years accounted for 60% of the cases. Scabies caused nearly one-fifth of the cases of skin disease. The symptomatic group consisted of those in whom full examination and investigation revealed no evidence of organic disease.

Almost one-quarter of the tuberculous infections were of the glands, bones or joints and a point of importance here is that, in Ibadan, cow's milk is obtainable only in the dried or condensed forms. Children below the age of 10 constituted 26% of the total cases of tuberculosis and two-thirds of these had intra-thoracic infections.

Gastro-enteritis accounted for almost half of the gastro-intestinal infections and dysentery either clinical, bacillary or amoebic for almost all of the remainder. Nutritional deficiencies were frequently multiple and 79% were in children. The nutritional state of many in the 1–5 years age-group was so near the border line between health and disease that almost any disturbance such as diarrhoea or fever resulted in overt malnutrition and especially protein malnutrition.

Helminthic infections were very common and an attempt was made to limit those classified as suffering from them to patients in whom they were producing symptoms. The 915 helminthic infections so categorized were made up as follows:—vesical schistosomiasis 75 cases, rectal schistosomiasis 5, *Wuchereria bancrofti* filariasis 31, onchocerciasis 157, loiasis 32, dracontiasis 82, taeniasis 14, ankylostomiasis 64, ascariasis and mixed intestinal helminths 452, other helminths 3.

Whooping cough accounted for 516 of the 637 bacterial infections, tetanus for 72, of which 39 were in children, and leprosy for 42. Although there had been a large epidemic of smallpox 3 months before the clinic opened, only 4 cases were encountered during the year under review. Poliomyelitis was diagnosed 81 times.

A primary diagnosis of anaemia was made 492 times and no case of pernicious anaemia was encountered but sickle-cell anaemia accounted for 105 patients of whom 87 were children.

Only 95 cases of yaws, 35 of syphilis and 459 of cardiovascular diseases were diagnosed [the small number of the last-named category is particularly noteworthy when it is recalled that there were in all 32,730 patients]. Of patients with cardiovascular diseases 288 presented with congestive heart failure which was not secondary to valvular disease. Some of these patients had hypertension but in many no cause was detected. There were 156 patients with hypertension and 39 with rheumatic fever and its cardiac sequelae.

The chief causes of child morbidity and the numbers of the different diseases encountered were as follows:—gastro-intestinal infections and functional intestinal disorders 2,717, respiratory infections 2,682, malaria 2,195, skin infection 1,398, malnutrition 1,168, tuberculosis 590, otitis media and externa 540, whooping cough 516. It was calculated from figures obtained in the clinic that the probability of survival beyond the age of 5 years was 446 per 1,000 live births.

[This is a fascinating paper and gives a valuable picture of the frequency of different diseases encountered in an urban area in Nigeria today. It should prove to be a powerful corrective to the views of those who sometimes nowadays state that they "see" only European diseases in such regions. The others are there for those looking out for them.] *A. W. Woodruff*

SWANEPOEL, A. **Tick Paralysis: Regional Neurological Involvement caused by** *Hyalomma truncatum*. *South African Med. J.* 1959, Oct. 31, v. 33, No. 44, 909–11, 2 figs. [23 refs.]

"A patient with regional tick paralysis of upper limb muscles is described.

"Transient sensory impairment occurred, and permanent lower-motor-neurone paralysis ensued.

"The offending tick was a male of the genus *Hyalomma truncatum*.

"A brief account is given of the clinical and aetiological features of human tick paralysis."

[See this *Bulletin*, 1951, v. 48, 405; 1953, v. 50, 344.]

MENTZ, H. E. A. & BERSOHN, I. **Porphyrin Metabolism and Liver Function in the Bantu.** *South African Med. J.* 1959, Nov. 7, v. 33, No. 45, 939–44.

"Since impaired liver function as well as increased excretion of urinary porphyrins are common findings in the Bantu, an attempt was made to correlate certain biochemical liver function tests with porphyrin metabolism. The results suggest a definite positive correlation."

MUKHERJEE, A. B., BANERJEE, N. & GHOSH, N. **Clinical Review of Tropical Eosinophilia with Observations on the Effects of Parenteral Diethyl Carbamazine Therapy.** *Calcutta Med. J.* 1959, Sept., v. 56, No. 9, 307–15.

"1. 50 cases of tropical eosinophilia have been reviewed in the present study and some of the etiological factors are discussed, the exact cause, however, not being possible to be determined. The role of allergy has to be regarded as an important mechanism in the production of this interesting clinical condition.

"2. The effects of parenteral diethyl carbamazine therapy are shown in the treatment as superior to other methods of treatment."

MISRA, S. S., NATH, K., SHANKER, A. & PRAKASH, S. **Diethylcarbamazine (Oral and Parenteral Therapy) in Tropical Pulmonary Eosinophilia.** *J. Indian Med. Ass.* 1959, Mar. 16, v. 32, No. 6, 232–43. [15 refs.]

In the introduction to this paper it is pointed out that poor or only temporary responses are obtained in tropical pulmonary eosinophilia after treatment with antibiotics, antihistaminics, adrenocortical steroids or aminopterin. In view, however, of the recent reports of successful treatment with diethylcarbamazine, this drug has been administered to 40 patients and the very favourable results are here reported.

The diagnostic criteria employed were the initial presence of more than

4,000 eosinophils per cmm. blood, the absence of evidence of filariasis in the history and on physical examination and the absence of parasites in stool, sputum and films of blood taken at night. In all cases there were, too, a dry cough, breathlessness and a pulmonary wheeze.

Diethylcarbamazine was administered orally in doses of 8 mgm. per kgm. of body weight daily to 32 patients and after preliminary experience with this treatment it was found that its administration could be discontinued as soon as an adequate haematological response had been obtained. To 8 patients, diethylcarbamazine was administered parenterally; 6 of these patients subsequently received further doses orally, 1 was given Mapharside intravenously, and one received 800 mgm. diethylcarbamazine parenterally only.

The criterion of cure was taken to be a drop of the eosinophil count to below 800 cells per cmm. together with freedom from relapse for an unspecified period. After orally administered therapy 31 of the 32 patients were cured and by the fourth day this was associated with some relief or complete relief from symptoms. Complete remission of physical signs was also observed in the 31 patients. The sternal marrow of 14 patients was examined before and after therapy. The initial films showed hyperplasia and predominance of immature and mature eosinophils but the later films revealed only a few eosinophils, most of which were mature. A cure occurred in less than 4 days in one patient, between 4 and 6 days in 3 patients, within 10 days in 17 patients and within 16 days in 26 patients; treatment was continued for more than 16 days in 6 cases. No serious toxic results were noted although a number of patients complained of anorexia and nausea.

Treatment with an initial dose of 800 mgm. or with 3–4 doses of 400 mgm. diethylcarbamazine given parenterally produced either none, or limited symptomatic improvement. In 1 patient the eosinophil count was brought down to 800 cells per cmm. but nausea, vomiting and somnolence were common and in 7 of the 8 patients a complete cure was not obtained until diethylcarbamazine was administered orally or Mapharside was administered.

In discussion of the results, the points are made that treatment with diethylcarbamazine brings about rapid symptomatic relief which contrasts with the troublesome initial symptomatic aggravation following arsenic treatment—2 patients who had proved resistant to arsenic therapy responded satisfactorily to diethylcarbamazine. No initial increase of eosinophils was noted in those treated with diethylcarbamazine. The maximal duration of the period of follow-up after treatment in this series has been 8 months. *A. W. Woodruff*

PARASITOLOGY: GENERAL

KUNTZ, R. E. **Intestinal Protozoans and Helminths in U.S. Military and Allied Personnel, Naval Hospital, Bethesda, Maryland.** *Amer. J. Trop. Med. & Hyg.* 1959, Sept., v. 8, No. 5, 561–4. [13 refs.]

Since 1946 data have been collected concerning the parasites present in some 37,000 stools examined from military personnel, their dependants and others entitled to medical care at the Naval Hospital, Bethesda, Maryland. During

the first two years, 1946 and 1948, military personnel formed a greater proportion of those examined than subsequently and the incidences reported are only approximate.

The annual incidences of parasitic protozoal and helminthic species for the period of 11 years are recorded in a table. These returns are not absolutely comparable but the trends are unmistakable. Between 1946 and 1951 there was a marked decrease in protozoal infections which subsequently continued to decline but at a lower rate. It is thought possible that the recent wide use of antibiotics may be responsible for the reduction in incidence. The figures are considerably lower than those generally calculated for the United States, though military personnel are thought to represent a typical cross-section of the population. Helminth infection rates are low and erratic, hookworm being more common than *Ascaris* since 1952. Many of the helminth infection rates quoted represent individual cases. *Enterobius* infections were infrequent considering that children were included in the examination each year.

The results are considered in relation to other surveys of intestinal parasites in the United States. *T. H. Davey*

CLARKSON, M. J. & OWEN, L. N. **The Parasites of Domestic Animals in the Bahama Islands.** *Ann. Trop. Med. & Parasit.* 1959, Sept., v. 53, No. 3, 341–6, 1 map.

MACKERRAS, M. Josephine. **The Haematozoa of Australian Mammals.** *Australian J. Zool.* 1959, Oct., v. 7, No. 2, 105–35, 76 figs. on 6 pls. [Numerous refs.]

LAINSON, R. *Atoxoplasma* **Garnham, 1950, as a Synonym for** *Lankesterella* **Labbé, 1899. Its Life Cycle in the English Sparrow** (*Passer domesticus domesticus* **Linn.).** *J. Protozoology.* Utica. 1959, Nov., v. 6, No. 4, 360–71, 49 figs. on 4 pls. [15 refs.]

See this *Bulletin*, 1951, v. 48, 292.

MARKELL, E. K. & VOGE, M. **Diagnostic Medical Parasitology.**

This book was reviewed on p. 203.

BERQUÓ, Elza S., BARBOSA, V. & COUTINHO, J. O. Notas sôbre o diagnóstico das parasitoses intestinais. I. Dados comparativos entre os resultados obtidos pelos métodos de "FAUST" e "MIFC". **[Diagnosis of Intestinal Parasites. I. Comparative Data of Results of Faust and MIFC Methods]** *Arquivos Facul. de Hig. e Saúde Pública Univ. de São Paulo.* 1958, Dec., v. 12, No. 2, 155–64.

The English summary appended to the paper is as follows:—

"The observations we present here are part of some studies we have done in order to select the most convenient method to diagnose the intestinal parasitism in human faeces.

"By continuing in this work observations begun by one of us (Coutinho) [this *Bulletin*, 1957, v. 54, 757], we are comparing results obtained in 200 faeces examinations done simultaneously by "FAUST" and by "MIFC". Such results found in the charts numbers 1 to 9 have been properly analysed according to the diagnoses by the two processes we are considering.

"It has been noticed that using the "FAUST" and "MIFC" methods simultaneously to diagnose the intestinal parasitism in human feces, one can conclude that both methods are similar in showing positives though they have differed significantly in the case of *Endolimax nana*.

"Since the occurrence of a single comparison in a series of nine comparisons has a small probability of being due to chance, we thought of such a difference as a consequence of a bigger specific weight of the cysts of these parasites which caused a greater positiveness by the centrifugation at the "MIFC", hypothesis which shall be investigated in later works."

THOMPSON, P. E. **Recent Developments in the Chemotherapy of Parasitic Infections.** *Bull. Calcutta School Trop. Med.* 1959, Oct., v. 7, No. 4, 186–90. [85 refs.]

ENTOMOLOGY AND INSECTICIDES: GENERAL ZOOLOGY

[Papers on the toxic effects of insecticides in man are abstracted in the *Bulletin of Hygiene* under the general heading of Occupational Hygiene and Toxicology.]

LU, Bu Jan & SUN, Huai Kyan. [**Survey on Mosquitoes in Tsinan**] *Acta Entomologica Sinica.* 1959, Oct., v. 9, No. 5, 483–9, 1 fig. [11 refs.] [In Chinese.]

The English summary appended to the paper is as follows:—

"A survey on the species of mosquito, their resting places as well as their breeding places was carried out during the period from March 1953 to September 1956.

"Altogether 11 species in 3 genera were discovered; they are: *C. pipiens* var. *pallens*, *C. tritaeniorhynchus*, *C. vorax*, *C. mimeticus*, *C. fuscanus*, *C. bitaeniorhynchus*, *A. hyrcanus* var. *sinensis*, *A. pattoni*, *Ae. albopictus*, *Ae. koreicus*, and *Ae. chemulpoensis*. Among these, *C. mimeticus*, *C. bitaeniorhynchus*, *C. fuscanus* and *Ae. chemulpoensis* are new records in Tsinan, Shantung. Of the 11 species, *C. pipiens* var. *pallens* is the most common inside the human dwellings, while *A. hyrcanus* var. *sinensis* and *Ae. albopictus* are the next common ones. *Anopheles hyrcanus* var. *sinensis* was found in the plains and *A. pattoni* in the hilly regions. The first batch of larvae of *C. pipiens* var. *pallens* was found on May 6th and the last in late November. The highest peaks of seasonal distribution curve of larvae of *C. pipiens* var. *pallens* and *Ae. albopictus* were in the mid-August and early August respectively. The density of larvae of the various species is closely related to the rainfall in the years."

SURTEES, G. **On the Distribution and Seasonal Incidence of Culicine Mosquitoes in Southern Nigeria.** *Proc. Roy. Entom. Soc. of London.* Ser. A. 1959, Oct. 23, v. 34, Pts. 7/9, 110–20. [31 refs.]

Observations during 1956–57 on culicine mosquitoes in and around the village of Ilobi, 50 miles north-west of Lagos, Nigeria, take account of larval habitats, distribution and seasonal abundance of some or all of 5 species of *Aëdes*, including *Aëdes aegypti*, 6 species of *Culex*, *Megarhinus brevipalpis*, 5 species of *Eretmapodites* and *Harpagomyia taeniarostris*.

Breeding places are classified as domestic containers, tree-holes, leaf axils, and floor containers (cocoa husks, gourd and snail shells, on the ground). *Aëdes aegypti* occurred twice in snail shells, once in a banana axil, otherwise in domestic containers (clay water-pots) indoors or outdoors. Clay and bamboo pots were set out in a transect from village across scrub to surrounding forest. *Aëdes aegypti* was mainly breeding and was the predominant species in the village, 8 other species showing some succession as the forest was approached. Similar pots sampled weekly for larvae of *Aëdes aegypti* and 4 other species showed, except for *E. chrysogaster,* increased densities at the beginning of the rains, a decline in the mid-rainy season (June to July), and a further rise before the low densities of the dry season. Other work by the author suggests the mid-rains decline is due to overcrowding at the larval stage, when adult populations are large and oviposition heavy, causing larval mortalities and delayed development. *D. S. Bertram*

LAIRD, M. **Fungal Parasites of Mosquito Larvae from the Oriental and Australian Regions, with a Key to the Genus** *Coelomomyces* **(Blastocladiales: Coelomomycetaceae).** *Canadian J. Zool.* 1959, Oct., v. 37, No. 5, 781–91, 8 figs. [16 refs.]

"*Coelomomyces finlayae* n. sp. and *C. macleayae* n. sp. are described from larvae of *Aëdes* (*Finlaya*) *notoscriptus* (Skuse) and *A.* (*Macleaya*) sp. respectively. Both type localities are in Queensland, Australia. *C. stegomyiae* Keilin var. *rotumae* n. var. parasitizes *Aëdes* (*Stegomyia*) sp. on the island of Rotuma, near Fiji. *C. cribrosus* Couch and Dodge and *C. indiana* Iyengar are recorded from new localities, British North Borneo in the first case and Cambodia in the second. New hosts are listed for *C. cribrosus: Culex* (*Lophoceraomyia*) *fraudatrix* Theobald; and *C. stegomyiae: Armigeres obturbans* (Walker). A key to the 21 adequately characterized species of *Coelomomyces* is followed by a brief discussion of the significance of these fungi."

BECKEL, W. E. & ATWOOD, H. L. **A Contribution to the Bionomics of the Mosquitoes of Algonquin Park.** *Canadian J. Zool.* 1959, Oct., v. 37, No. 5, 763–70, 2 figs.

"The results of one season's mosquito collecting in Algonquin Park [Ontario] are presented giving data on relative abundance, seasonal distribution, and habitat of larvae and adults.

"General correlations between mosquito distribution and vegetation, and distribution and exposure are mentioned.

"The list of species found in the Park now includes 3 species of *Anopheles*,

17 of *Aedes*, 3 of *Culiseta*, 2 of *Culex*, 1 of *Wyeomia*, and 1 of *Mansonia*. Twenty-one of these 27 species have been taken biting man. Of these the most common in order of time of peak abundance were *Aedes communis*, *Aedes punctor*, *Mansonia perturbans*, and *Aedes canadensis*."

[See this *Bulletin*, 1956, v. 53, 674.]

PAL, R. & KRISHNAMURTHY, B. S. **Induced Mutations of X-Ray Irradiations in *Culex fatigans* Wied (1828).** [Correspondence.] *Nature*. 1959, Aug. 22, v. 184, Suppl. No. 9, 658, 1 fig.

X-ray irradiation, 4,150 r for 60 minutes, of adult *Culex fatigans* has produced, in mutation, "spread-wing", where both wings or only one wing are extended at right angles to the rest of the body. The authors suggest that this character is due to a single gene that is not sex linked. They also record heavy mortality in the eggs produced by irradiated females and in the subsequent egg rafts producing the F_1 and F_3 generations. [See also this *Bulletin*, 1956, v. 53, 1281.] *B. R. Laurence*

CRAIG, G. B., Jr. & GILLHAM, N. W. **The Inheritance of Larval Pigmentation in *Aedes aegypti*.** *J. Heredity*. 1959, May–June, v. 50, No. 3, 115–23, 1 fig. [14 refs.]

ORTIZ MARIOTTE, C. & LUNA BATALLA, M. Erradicación del *Aedes aegypti* en México. [**Eradication of *Aëdes aegypti* in Mexico**] *Bol. Epidemiológico*. Mexico. 1959, Jan.–Feb.–Mar., v. 23, No. 1, 1–5, 4 figs.

Surveys in 1956 of 2,555 houses in 14 localities of Mexico showed that *Aëdes aegypti* occurred in 2·9 to 48·4% of the houses, depending on locality. Some studies are reported on control of this mosquito by applications of DDT as indoor wall deposits, and as perifocal sprays of breeding places. This was of interest in relation to the initiation of indoor residual spraying with DDT as a national anti-malaria programme. It is concluded that indoor deposits of DDT at 2 gm. per square metre, twice a year, should be efficient in eradicating *Aëdes aegypti*. *D. S. Bertram*

GONDA, O., KALUSZYNER, A. & AVI-DOR, Y. **Effect of 1:1:1-Trichloro-2:2-di-(*p*-Chlorophenyl)ethane (DDT) and related Compounds on the Adenosine Triphosphate-Phosphate Exchange catalysed by a Particulate Fraction from the Mosquito.** *Biochem. J.* 1959, Dec., v. 73, No. 4, 583–7, 6 figs. [17 refs.]

ACREE, F., Jr., DAVIS, P. L., SPEAR, S. F., LABRECQUE, G. C. & WILSON, H. G. **Nature of the Attractant in Sucrose fed on by House Flies.** *J. Econom. Entom.* 1959, Oct., v. 52, No. 5, 981–5.

"The attractiveness to house flies (*Musca domestica* L.) of traps containing other house flies feeding on sucrose is probably related to a relative-humidity

gradient generated by the moisture excreted by the flies. In a group of tests run at 50 to 73% ambient relative humidity flies responded to traps in which the relative humidity was 18 to 38% higher than the ambient value. The addition of about 6% of water to sucrose increased its attractiveness in petri-dish tests so that the mixture was usually more attractive than sucrose fed on by house flies. No evidence was found for a volatile chemical reaction product of sucrose having appreciable attractiveness. In the tests only 10 to 15% of the flies were attracted to fed-on sucrose, indicating that the fly factor is a low-order attractant."

KILPATRICK, J. W. & SCHOOF, H. F. **Interrelationship of Water and *Hermetia illucens* Breeding to *Musca domestica* Production in Human Excrement.** *Amer. J. Trop. Med. & Hyg.* 1959, Sept., v. 8, No. 5, 597–602, 1 fig.

In the United States treatment of pit privies with insecticides has produced an increase in house-fly production [this *Bulletin*, 1955, v. 52, 221 ; 1956, v. 53, 1284]. More recent studies in Georgia have shown that few *Musca domestica* are produced from untreated privies, but that treatment with dieldrin, BHC or chlordane greatly increases house-fly production, although treatments with DDT, malathion and diazinon do not.

Heavy infestations of the stratiomyid fly, *Hermetia illucens*, are characteristic of untreated privies where the larvae live in semi-liquid excrement. Treated privies contain few larvae of *Hermetia* and more solid excrement. The addition of sawdust to the untreated excrement, or drainage, increased the production of house-flies. The authors believe that large numbers of *Hermetia* larvae in the untreated privies reduce the excrement to semi-liquid form which is then unsuitable for house-fly breeding. [For laboratory experiments with larvae of *Hermetia* and *Musca* see *ibid.*, 1956, v. 53, 1391.] *B. R. Laurence*

MILANI, R. Differenze osservate tra ceppi di *Musca domestica* L. nelle variazioni di risposta ai trattamenti tossicologici determinate da condizioni sperimentali. [**Differences in the Effect of Experimental Conditions on the Response to Toxicological Treatment of Strains of House-Fly**] *Riv. di Parassit.* Rome. 1959, June, v. 20, No. 2, 111–24, 6 figs. [11 refs.] English summary.

The "pattern of response" to DDT shown by *Musca domestica* treated topically (indicated by the percentage "knockdown" over a period of hours) has been investigated in several DDT-resistant and susceptible strains. The responses of individual strains to (a) differences in the applied dose and (b) differences in temperature, have been noted.

The "pattern of response" shown by susceptible strains varied at different dosages. Resistant strains however gave graded but very similar responses to intoxication at different dosages. This was thought to imply that the amount of insecticide available in the external environment was more directly effective on susceptible than on knock-down resistant strains. Susceptible and resistant strains were most noticeably different at highly effective dosages.

The effect of temperature on the "pattern of response" differed between

strains. It could be without effect, or act similarly in both sexes, or differently with sex when the dose was high (0·4 mgm./cm.^{2}).

In those strains where the temperature had some effect, the temperature coefficient was positive at a dose of 0·4 mgm./cm.^{2} (*i.e.* the effectiveness of the dose increased with rise in temperature) but negative at a dose of 0·1 mgm./cm.^{2}

Similar differences in response to variations in dose and temperature were demonstrated between resistant and susceptible individuals from a recently colonized heterogeneous strain. *R. J. Wood*

LOVELL, J. B. & KEARNS, C. W. **Inheritance of DDT-Dehydrochlorinase in the House Fly.** *J. Econom. Entom.* 1959, Oct., v. 52, No. 5, 931–5, 4 figs.

" A modification of a method devised by Sternburg *et al.* (1954, Jour. Agric. and Food Chem., 1, 125–30) made it possible to assay the DDT-dehydrochlorinase (DDT'ase) in individual flies of a population of DDT-resistant (R) house flies, *Musca domestica* L. By this means it was possible to obtain a measure of the variability of this enzyme in a population. It was also possible to relate the concentration of DDT'ase in parents with that found in the offspring. Regardless of the enzyme activity of the individual parents, that of the progeny appeared to drift toward a mean value.

" Flies selected for resistance to DDT alone have considerably less DDT'ase than after being selected for resistance to a combination of DDT and DMC (bis-(*p*-chlorophenyl) methyl carbinol). A strain of flies selected for resistance to combination (DMC-R strain) was used to cross, inbreed and backcross with susceptible flies to determine the inheritance pattern of DDT'ase and its relationship to resistance. By this means a quantitative relationship between presence of DDT'ase and resistance to DDT has been established. Furthermore, the pattern of inheritance of resistance and DDT'ase activity shows no serious discrepancy with the proposal of Milani (1956, Riv. Parassitol., 17: 223–46) [this *Bulletin*, 1957, v. 54, 1141], that resistance to DDT may be governed by a single partially dominant gene which behaves according to simple Mendelian principles."

WINTERINGHAM, F. P. W. & HARRISON, A. **Mechanisms of Resistance of Adult Houseflies to the Insecticide Dieldrin.** *Nature.* 1959, Aug. 22, v. 184, 608–10, 1 fig.

The sulphur analogue of dieldrin labelled with sulphur-35 has been applied to susceptible and dieldrin-resistant *Musca domestica* at such a dosage that the susceptible flies succumbed in 3 hours while the resistant ones were apparently unharmed. The fate of the radioactive compound was followed in both strains by radio-paper-chromatographic techniques, and the conclusion was reached that resistance is not due to lack of penetration of the cuticle or gross differences in the rates of excretion or metabolism of the insecticide. Sealing of the anus in the resistant flies led to an accumulation of metabolites normally excreted but this accumulation still did not produce any toxic symptoms in the insects.

The authors suggest that the protective mechanism of resistant flies may be confined to particular sites, *e.g.* nerve ganglia, which involve only a small fraction of the absorbed insecticide. Gross extraction of the whole insect as was done in these experiments would not show this. *G. Davidson*

HUNTER, P. E., CUTKOMP, L. K. & KOLKAILA, A. M. **Reproduction following Insecticidal Treatment in Two Resistant Strains of House Flies.** [Scientific Notes.] *J. Econom. Entom.* 1959, Aug., v. 52, No. 4, 765–6.

In an earlier work it was reported that the administration of sub-lethal doses of diazinon or DDT to females of a DDT-resistant Orlando strain of house-flies resulted in a reduction in certain phases of reproduction; in contrast, females of a susceptible strain subjected to the same treatment exhibited an improved capacity for reproduction [HUNTER *et al.*, *J. Econom. Entom.*, 1958, v. 51, 579].

Now the authors report on a similar series of experiments with two other resistant strains: a DDT-45 strain, resistant to DDT, Dilan, dieldrin and DDVP, and a Roberds strain resistant to DDT and dieldrin. No tests were done on a susceptible strain. Females from each strain were treated with sublethal doses of diazinon or DDT, dissolved in olive oil, and records were made on several aspects of reproduction. Females treated with plain olive oil acted as controls.

With the exception of egg fertility of the DDT-45 flies treated with diazinon, treated females of both strains showed similar reductions in all phases of reproduction when compared with the controls. With regard to egg fertility, it was found that the females of the DDT-45 strain treated with diazinon (but not the Roberds strain) laid a significantly larger number of fertile eggs than their controls.

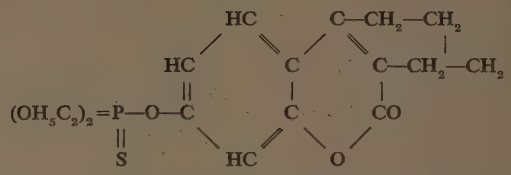
The potential adult offspring per 100 females was estimated. In the Roberds strain the values were 4,332, 4,767 and 6,302 for females of the DDT, diazinon and control groups, respectively. The corresponding values for the DDT-45 strain were 4,870, 4,469 and 6,773. These results are in general agreement with those previously obtained with the Orlando strain. *B. C. Fine*

PERRY, A. S. & BUCKNER, Annette J. **The Metabolic Fate of Prolan in a Dilan-Resistant Strain of House Flies.** *J. Econom. Entom.* 1959, Oct., v. 52, No. 5, 997–1002, 3 figs. [11 refs.]

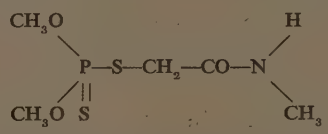
MARIANI, M. & ODDO, F. Sull'impiego di un nuovo insetticida organo-fosforico nella lotta contro la *Musca domestica.* [**The Use of a New Organo-Phosphorus Insecticide in the Campaign against the House-Fly**] *Riv. di Parassit.* Rome. 1959, June, v. 20, No. 2, 125–40, 9 figs. [16 refs.] English summary.

Laboratory and field experiments have been used to test the effectiveness of a new organophosphorus insecticide, Dition. Two formulations were used,

both *pastes* emulsifiable in water: Dition Pasta containing 25% Dition with 55% synergized DDT;



and Dition 18 Pasta made up of 18% Dition, 54·5% synergized DDT, and 5% of a compound, Rogor, represented by the formula—



Laboratory experiments showed that both these formulations were toxic to DDT-resistant and dieldrin-resistant strains of *Musca domestica*. In the field experiments reductions of 90% in *M. domestica* populations were noted up to 14 weeks after treatment. "Partial treatment" involving the main sources of infestation were as effective as "total treatment" involving whole villages. Adequate control was gained over flies showing a modest level of resistance to other organophosphorus compounds. This insecticide remained active for more than 4 months.

It was noted that the two methods used during these experiments to assess the density of flies, the "grid method" of SCUDDER [*Bull. Hyg.*, 1947, v. 22, 653] and the "fly paper method", gave results differing by about 10%.

R. J. Wood

PIQUETT, P. G. & GERSDORFF, W. A. **Screening Tests in 1957 with Synthetic Compounds for Toxicity to House Flies when applied in Space Sprays.** *J. Econom. Entom.* 1959, Oct., v. 52, No. 5, 954–5.

"The results of preliminary evaluations of 107 synthetic compounds when applied as space sprays to the house fly, *Musca domestica* L., are reported. Eleven compounds, all but one esters of *dl-cis-trans*-chrysanthemumic acid, phosphoric acid, or a substituted phosphoric acid, were sufficiently toxic to warrant further study."

OVAZZA, M., ADAM, J. P. & BAILLY-CHOUMARA, H. Contribution à l'étude des Tabanides d'Afrique Occidentale Française. III. Tabanides de Guinée. **[Study of Tabanids of French West Africa. III. Tabanids of Guinea]** *Bull. Soc. Path. Exot.* 1959, May–June, v. 52, No. 3, 366–73, 1 fig.

GRAHAM, A. J. & DUDLEY, F. H. **Culture Methods for Mass Rearing of Screw-Worm Larvae.** *J. Econom. Entom.* 1959, Oct., v. 52, No. 5, 1006–8.

DIAS, J. A. T. S. **Notes on Various Ticks (Acarina-Ixodoidea) in Collection at some Entomological Institutes in Paris and London.** *Anais Inst. Med. Trop.* Lisbon. 1958, June, v. 15, No. 2, 459–563. [Numerous refs.]

This rather long paper is the result of a study of museum specimens of ixodid ticks, some of them types, which the author undertook in 1955. The source of most of the specimens is Africa and the museums visited were at the Pasteur Institute, Paris, the Paris Museum, the Parasitological Laboratory of the Medical School of Paris, and the British Museum (Natural History), London. 11 genera of ixodid ticks (*Ixodes*, *Rhipicephalus*, *Hyalomma*, *Boophilus*, *Cosmiomma*, *Amblyomma*, *Aponomma*, *Dermacentor*, *Rhipicentor*, *Anocentor* and *Haemaphysalis*) and 1 genus of argasid ticks (*Argas*) are dealt with. Most of these genera have been subdivided into subgenera, some of which, like *Arthuriella* under *Ixodes* and *Sharifiella* under *Haemaphysalis*, are new. Keys are given to 7 subgenera of *Ixodes*, 5 of *Rhipicephalus*, 3 of *Hyalomma*, 3 of *Boophilus*, 5 of *Dermacentor* and 2 each of *Aponomma*, *Haemaphysalis* and *Argas*. A total of 112 species and subspecies are commented upon. Under each of these, notes on the specimens seen, including locality and hosts, as well as critical comments regarding diagnostic characters and synonymy, are given. The extensive bibliography (over 200 references are listed) will be useful to all persons interested in this subject.

[A few errors, scientific and typographical, appear in the text. The subgenus *Sharifiella* of *Haemaphysalis* with *Haemaphysalis theilerae* as type is not mentioned in the key to haemaphysalid subgenera. The species *theilerae*, in the key, is given as a type of the subgenus *Alloceraea* together with the species *inermis*. Typographical errors such as Walles for Wales (p. 469) and *minua* for the species *minuta* (p. 536) could easily have been avoided.]

M. G. R. Varma

WEBBE, G. & SHUTE, G. T. **A Further Note on the Action on Fish of Chlorinated Hydrocarbons when used as Larvicides.** *Ann. Trop. Med. & Parasit.* 1959, Apr., v. 53, No. 1, 47–50.

The effect of insecticides on fish of the genus *Tilapia* has been investigated in a series of field trials carried out in the Tanga Province of Tanganyika.

Three species of *Tilapia* confined in experimental ponds were exposed to the action of dusts containing 5% w/w DDT, 2½% w/w dieldrin and 2½% w/w aldrin, to a gammexane powder larvicide containing 3% w/w gamma BHC, and to dieldrin granules (2% w/w).

One species succumbed more readily to heavy dosage of dieldrin than did the other two but none was affected by DDT, dieldrin or aldrin dusts, by the gammexane powder larvicide or by dieldrin granules, applied weekly at the rate of 1 lb. per acre for 20 weeks. A slight reduction in growth rate of treated fish was not considered significant. Breeding was unimpaired.

No deterioration in taste was detected in fish reared in water treated with these quantities of insecticide.

[For previous studies, see this *Bulletin*, 1958, v. 55, 339.] *R. J. Wood*

CANADIAN J. BIOCHEM. & PHYSIOL. 1959, Sept., v. 37, No. 9, 1089–1151, 5 figs. [Numerous refs.] **Symposium on Metabolism of Insecticides.**

The 10 papers which make up the symposium were given at a meeting at Ontario Agricultural College in November 1958. After a brief introduction

by E. Y. Spencer, the subject of insecticide resistance is reviewed in general terms by A. W. A. Brown (pp. 1091–1097). This paper gives the impression of a continually expanding problem with very many fundamental problems, of which the biochemical defence mechanism is a particularly important one. Most progress has been made in revealing detoxification systems and H. H. Moorefield (pp. 1099–1103) deals with these in connexion with chlorinated hydrocarbon insecticides. Briefly, the soundest evidence concerns DDT-dehydrochlorinase in flies and this may confer resistance in certain other pests also, though it certainly does not explain all cases of DDT resistance. Metabolism of gamma BHC has also been proved in flies, but the significance of this is uncertain since BHC resistance is always linked with even stronger dieldrin resistance and there is no evidence of dieldrin detoxification being responsible for resistance.

D. G. Peterson and A. A. Kingscote (pp. 1105–1112) discuss control of animal parasites by systemic insecticides. The most hopeful type seem to be the organophosphorus insecticides which undergo a variety of reactions in animal tissues, some increasing and some decreasing their anti-esterase activity (and hence their toxicity). In certain compounds the detoxifying metabolism exceeds the toxifying process in mammals but not in insects; such insecticides are so safe that some (*e.g.* ronnel = Trolene) can be administered by mouth to cattle to kill screw-worms, etc. Others are safe to apply dermally for the same purpose. R. D. O'Brien (pp. 1113–1122) describes some of the biochemical work which has partly explained differential toxicity. Further details are given in papers by B. N. Smallman (pp. 1123–1126) and E. H. Colhoun (pp. 1127–1134). These workers agree that anticholinesterase activity is the basic mechanism of organophosphorus toxicity in insects as well as in mammals, though there are still some puzzles. For example, the main effect seems to take place soon after poisoning, as shown by a sudden rise in acetylcholine (ACh); the later rise in this compound is also found after DDT poisoning and may be due to degenerative effects in dying tissues. Another problem is the fact that anticholinesterase activity of organophosphorus compounds can be suppressed by pyridine 2-aldoxime methiodide (PAM) in treated insects, which nevertheless eventually die. The suggestion is raised that the organophosphorus insecticides may also suppress acetylation of choline so that the lack of ACh, rather than suppression of cholinesterase, may be lethal.

E. H. Smith and A. C. Wagenknecht (pp. 1135–1144) deal with another difficulty in our comprehension of the mechanism of action of organophosphorus insecticides: their ovicidal action. Since young eggs do not have functional nervous systems, how is it that they can be killed by these compounds? It has also been noted that other esterases are present, sometimes more effectively inhibited than cholinesterase, so that perhaps they are the site of toxic action. However, there are answers to most of these objections. Poisoning of young eggs by organophosphorus compounds does not prevent their continued development and it appears that the poison is stored until the cholinergic system develops and is then poisoned. To prevent development, exceedingly high concentrations are necessary, so that possibly secondary poisoning effects occur. In the later egg stages, poisoning is normal, resulting in high ACh levels; and susceptibility of different species is parallel to the sensitivity of their cholinesterase inhibition.

E. Y. SPENCER (pp. 1145–1150) reviews the metabolic changes of organophosphorus insecticides in plant tissues. The systemic action of these compounds in plants has been known for a long time and the various potentiation or detoxication changes are better known than those in animal tissues. The important point is the relative rate of the degradation process in relation to the times required to kill the insects and the time for removing harmful residues (in plants likely to be eaten). Finally, a very short paper by H. MARTIN (p. 1151) calls attention to some interesting problems connected with steric relationships of toxic pesticides.

The whole symposium provides a stimulating critique of modern work and includes some items from unpublished research. *J. R. Busvine*

MISCELLANEOUS PAPERS

DAVEY, T. H. **Disease and Population Pressure in the Tropics. [i] The Social and Economic Background of Disease in the Tropics.** pp. 1–12. **[ii] Population Pressure: Cause and Cure.** pp. 13–22. 1958. Ibadan: Ibadan University Press. [2s.]

Few of the diseases, predominantly of the communicable group, rife in the tropics are peculiar to hot climates. Leprosy, malaria, typhus and others have been common in countries with temperate climates, but declined or died out as general hygiene and living standards advanced, long before their causative organisms and specific eradication measures were known. In the rural tropics ill health breeds poverty and *vice versa*, creating a vicious downward spiral of living standards, child mortality amounting to 50% of births, and short expectation of life. Unfortunately, medical services have concentrated extensively on hospitals which, essential though they are, have little effect in the prevention of disease, and are so expensive to build and run that they absorb the funds which would better be spent on preventive measures.

Sick people are unproductive, and great economic benefit to the community results from the prevention of disabling disease. Preventive campaigns have dramatic effects on the incidence of communicable diseases, which is unaffected by the curing of individual patients in hospitals. The cost of a public health service is very much less than that of a hospital organization, and efficient public health by controlling mass endemic disease leaves hospital beds free to be used for their proper purposes. Recent spectacular advances in the control of insect-borne diseases by chemicals have drawn attention away from those resulting from low standards of hygiene, in the control of which little progress has been made—nor will progress be made until the fundamental background of these conditions, poverty, is ameliorated. The achievement of this aim requires the coordinated efforts of doctors, engineers, agriculturalists, etc., and a full understanding of their aims by the public. Apathy and ignorance can prevent any advance, and public enlightenment is an essential preliminary to combating traditional unhygienic habits. In this respect, fundamental education, especially of women, is all-important, and must be continued by steady effort, however discouraging the early results. The health

visitor is probably the most valuable agent. She achieves the first vital step of gaining goodwill through assisting in cases of illness, and this opens the way to propaganda in favour of better ways of living. She (or he) should be of local origin, trained perhaps only in simple techniques but imbued with intense belief in what she teaches. Traditional unhygienic habits and superstitions can eventually be broken down; often practical demonstrations of the benefits of modern methods carry conviction. Always the aim should be not passive acceptance of assistance by the community, but the encouragement of self-help and the attitude of mind that demands further progress. Grandiose development schemes involving large capital outlay are unlikely to affect rural standards of living: the need is rather for cooperative schemes, fundamental education and community development.

Up to now Africa has been little concerned with the increasing population pressure that is so urgent a problem in Asia. Nevertheless, population densities of up to 1,300 a square mile exist in parts of Nigeria and its total population increased by 58% between 1931 and 1952–53. Overpopulation is not a simple matter of numerical density: an overpopulated area is one which has to support more inhabitants than can be provided with the necessities of life out of its natural resources *at their existing stage of development*. Further development must include improved agricultural methods, and also the exploitation of natural resources. For the latter, outside capital is required. It is unwise to assume that world food production can be expanded indefinitely, and therefore the limitation of population growth is desirable. The annual world population growth of 20 to 30 millions takes place almost entirely in underdeveloped countries, as the *per caput* consumption of nutritious foods is actually falling.

Various proposals have been made for solving the problem of population pressure. The policy of UNO and FAO, to increase food production, so far has produced disappointing results. The classical policy of migration cannot be applied to countries such as India, as the problem is on altogether too large a scale. Family limitation is desirable, but hardest to achieve where the need is greatest, in poverty-stricken rural communities. Industrialization and urbanization, with eventual rise in standards and costs of living, historically have been the factors inducing family limitation. Apart from war, pestilence and famine, this process appears to be the only natural way in which population expansion can be checked. It must be accompanied by greatly increased agricultural efficiency if the new towns are to be fed; this implies improved communications, new markets and the encouragement of thrift in order that local capital shall come into being. Coordinated planning, with production increase matching that of population, is particularly important. Modern medical methods make possible very dramatic falls in death rates, and priority should be given to diseases which interfere with productivity. *B. B. Waddy*

FENDALL, N. R. E. **Housing, Health and Happiness.** *East African Med. J.* 1959, Sept., v. 36, No. 9, 473–85. [11 refs.]

The author of this address states that in selecting priorities among the many health problems in developing countries one should concentrate on the family in its home environment. The housing problem is accentuated by

population expansion and by the rapid progress of urbanization and industrialization. The population of Nairobi, for example, has increased by 86% in the decade ending 1958, and other cities and towns showed similar figures. A larger proportion of women and children than formerly is included in the increase, indicating a tendency to settle in towns.

Surveys revealing the size of the problem were carried out in Kenya in two provincial towns and one country town. The findings revealed a serious condition of overcrowding and a lack of family accommodation. Building costs varied from £75 to £115 per room. On this basis very heavy expenditure was necessary in the towns; in Nairobi, for example, an increase of 50,000 Africans would involve expenditure of over £5 millions on housing.

Adequacy of housing was based until recently on bed space per individual, but is now based on living space for the family, safe clean water and a safe conservancy system. Housing needs are being met in rural areas; villages are enlarging and locally available materials are used to build improved indigenous-type housing. The urban problem is more difficult and more urgent. The difficulties comprise high land values, high building standards and other social and economic factors, including the rapidity of obsolescence of housing as a result of rising standards of African living. A suitable house need only last for 15 years but maintenance costs should not be high. A Central Housing Fund has been established to make loans for building construction mainly for families in and around towns. It is recommended that by simplifying building an attempt should be made to build a 2-roomed house for £100 and accommodation for one person for £20. The author contends that the aim should be housing for all within the economic capacity of the country while safeguarding environmental sanitation and living space for the family. *T. H. Davey*

GELFAND, M. **The African in Transition.** *Central African J. of Med.* 1959, Sept., v. 5, No. 9, 486–8.

This is another of the illuminating papers which Gelfand has produced as a result of his profound knowledge of Africans and sympathy with their problems and way of life. He divides them into 3 groups—Preliterate, Semiliterate and Literate.

The preliterate Africans subsist on a poor diet and are subject to kwashiorkor and other consequences of that diet: they have schistosomiasis, malaria, and probably hookworm and syphilis. These factors of diet and infection are reflected in their serum proteins. They have no education other than tribal lore and ritual; they are not trained to think independently or to develop complex ideas; they do not envisage progress, but they have great charm and will do repetitive work well.

The semiliterate Africans—for instance, the hospital orderlies, messengers and interpreters—eat well and are relatively free from infections. Gelfand thinks that they are probably the most favourably situated of the 3 groups, for the literate Africans, though well fed, are prone to the psychological tensions and physical diseases of Europeans. "We have to pay for our civilization. Most of us agree that it is worth the price, but some may be so bold as to think that my category two African [Semiliterate] is perhaps the best off in the long run." *Charles Wilcocks*

GELFAND, M. **The Shona Mother and her Child.** *Mother & Child.* 1959, Aug., v. 30, No. 5, 120–23.

In this paper Gelfand gives in considerable detail the traditional procedures observed by pregnant women and their husbands from their first contact with the African midwife (who is usually a woman who herself has borne children and who is interested in the processes of delivery) until their final visit to her well after the birth. These ritual procedures mostly relate to the actions necessary to preserve the infant from evil influences. He goes on to describe how the mother trains and feeds the child up to the age of puberty or beyond.

The patterns of life are laid down by custom, and the "discipline imposed on a growing African child is very strict and severe punishment is imposed on him for doing anything unpleasant".

[This is another paper which illustrates the way in which Africans are brought up in the belief that the supernatural surrounds them throughout life, and that they must at all times obey the rules handed down to them.]

Charles Wilcocks

REPORTS AND SURVEYS

DOURY, P. Le Hoggar. Étude médicale. [**Medical Study of Hoggar**] *Arch. Inst. Pasteur d'Algérie.* 1959, Mar., v. 37, No. 1, 104–64, 2 text figs. & 36 figs. on 18 pls. [30 refs.]

This continues the interesting series of monographs about the history of remote areas in French Africa [see this *Bulletin*, 1957, v. 54, 894, 896, 1479; 1958, v. 55, 1182; 1960, v. 57, 90]. Hoggar, with Tamanrasset as its main town, lies in the remote centre of the Sahara. The Hoggar mountains, rising to 3,000 m., form the frontier between Mediterranean and Sudanese climatic influences. Rainfall at Tamanrasset averages 50 mm. annually, relative humidity averages 27%. The temperature range of 13° to 35°C. is surprisingly small, but Tamanrasset lies at an altitude of 1,400 m. The total population of Hoggar in 1930 was 4,400 of whom 3,250 were nomadic. In 1954 it was 10,089, of whom 4,300 were Touaregs, the remainder being Negroes (mostly freed slaves and slaves of the Touaregs) and Arabs. The European population of Tamanrasset, 70 in 1950, rose to over 300 by 1957. Arabs and Negroes tend towards sedentary village life; there are less than a dozen villages of more than 200 population, but some 30 smaller settlements. However, the great increase in population since 1930 has accrued almost exclusively to the sedentary types. The nomads, particularly the Touaregs, have shown lower birth than death rates for many years now.

As in other Sahara oases, *Anopheles hispaniola*, *A multicolor* and *A. sergenti* maintain the transmission of malaria, mainly *Plasmodium vivax* though *P. falciparum* and *P. malariae* are diagnosed occasionally. Travellers with caravans bring the infection into the oases regularly. One survey of 100 nomads showed a spleen rate of 95% and a parasite rate of 50%. Many *Phlebotomus* spp. are

found. Papataci fever becomes epidemic annually. Leishmaniasis has usually been reported as absent, but recently a few autochthonous cases have been found. Among alimentary infections, infectious hepatitis is not uncommon. The respiratory infections spread when introduced, despite the low population density. Smallpox has been conquered by universal vaccination, but tuberculosis is spreading gradually through contacts with Europeans and itinerant traders: in a recent survey 29·3% had positive reactions to the BCG tuberculin test [see FOLEY and PARROT, *Bull. Hyg.*, 1955, v. 30, 754]. The frequency of syphilitic infection has been variously assessed. Mucocutaneous lesions are most often seen, chancres seldom, and congenital and cardio-vascular lesions are rare. [The existence of non-venereal syphilis, or bejel, is not discussed, but the description given would fit this condition.] Trachoma is a veritable scourge among the sedentary population, but the nomads often are free from it. Protein and fat deficiency after weaning is universal, but overt vitamin deficiencies are seldom seen except in labour gangs living on iron rations, and in Europeans occasionally. [See GALAN, this *Bulletin*, 1952, v. 49, 172.]

B. B. Waddy

LEWIS, Oscar, with the assistance of Victor BARNOUW. **Village Life in Northern India. Studies in a Delhi Village.** pp. xiii + 384, illustrated. 1958. Urbana: University of Illinois Press. Illinois, U.S.A. [60s.]

This is a study in social anthropology, with chapters on the setting, on caste, on land tenure and economics, on group dynamics—a study of factions within castes—on the marriage cycle, on the festival cycle, on concepts of religion and ethics, on concepts of disease causation and cure, and a comparative analysis (with a village in the highlands of Mexico). There is an appendix on the use of village records, and a glossary of indigenous terms used in the text because of their significance for the study. The chapter on concepts of disease causation and cure is likely to be of most significance to readers of this *Bulletin* and an attempt will be made to summarize it.

The social anthropologist's case for the better understanding of the attitudes of groups of people in underdeveloped countries to questions of health and disease is presented with clarity and moderation. This section illustrates ways in which custom and even superstition can be met half-way without unjustifiable capitulations. For instance, number rituals can be employed in prescription-writing—"Take this three times a day for three successive days", or boiled tea may be prescribed instead of issuing an instruction that drinking water is to be boiled. Understanding of the world-view of the people, it is emphasized, leads to the view that it is a question of re-education from an existing framework of well-established beliefs rather than of education from a state of ignorance.

A particular vigour is imparted to this thesis by a series of interviews concerning the causation and cure of disease in which the reader is given verbatim question and answer from talks with 8 villagers—5 Jats, of whom one was a woman (a land-owning, agricultural caste, the highest caste practising widow remarriage), 1 Brahman, 1 Camar (a low-caste, leather-worker group), and 1 Bhangi (sweeper). A varying number of these 8 give their views on malaria, smallpox, typhoid, cholera, diarrhoea, dysentery, respiratory diseases—pneumonia, tuberculosis—rheumatism, postpartum puerperal fever, eye

inflammation, hysteria and spirit possession. For example, one interview on typhoid with a Camar, is as follows:—

Camar: "In typhoid there are something like sand particles on the front portion of the neck and chest. The patient feels discomfort and at times loses consciousness. He begins to talk as if he were dreaming something. He has a slight temperature. There is sometimes pain in the ribs. There is a repellent smell from the patient. Mostly it is due to the influence of evil spirits. The patient gets fever from them. Then the goddess, Kanti Mata, appears in the shape of sandy particles on the chest. It is believed that she comes to drive away the evil spirits."

Q. "Before the goddess appears, how do you know that the patient is suffering from typhoid?"

A. "If the patient's fever does not go down for two or three days, the people go to visit a pundit or a curer. He tells them that the patient is suffering from the influence of evil spirits. They set aside an offering to Kanti Mata consisting of *gulgulas* [a sweet cake], *patasas* [a sweetmeat], and coconut. This is given to the goddess after the patient has recovered. No other treatment is followed. Cleanliness is observed, however, and fruits like grapes are given to the patient. After browning flour on the fire, sugar and some milk are added to it, and the mixture is given to the patient to eat. In seven or eight days the marks on the chest become black, and the patient recovers. Sometimes he may not recover for a month, if the shadow of a person in new clothes falls over him. *Nim* leaves [a revered tree] are hung by the door to keep away evil influences. Some incense is burned. Such a shadow is very dangerous and may lead to the death of the patient. Therefore foreign people and men or women who may be wearing new clothes are not allowed to enter the patient's room."

Food is the most commonly mentioned item in relation to disease, but not prominently in connexion with typhoid and cholera. The gods, fate, evil spirits or the evil eye, are all also implicated, though in a selective way and in relation to certain diseases only. The less educated groups tended to give the greatest prominence to supernatural agencies.

Some of the persons questioned showed good knowledge of particular diseases, for instance of the role of mosquitoes in malaria, or of the value of smallpox vaccination, but additional factors were also usually cited in the causation of disease.

A review of this material, the author submits, shows that there is an important problem of communication here. The causes and cures of most of the diseases discussed above are well known to Western medicine. The problem is how to bring this knowledge to the vast population of India's villages, whose death rate is among the highest in the world. There seem to be communication blocks even within the village of Rampur itself, as is indicated by the somewhat greater sophistication of the Jats, the land-owning caste, as compared with the poorer and less educated lower-caste, Bhangis and Camars. Evidently the medical information imparted in school does not diffuse readily through all the caste groups.

The author hopes that the data in this chapter will be of some practical use to people concerned with Community Development Projects; for, as argued earlier, a knowledge of local beliefs should be of help both in treating

particular ailments and in learning to understand the basic concepts of the village people. *A. T. A. Learmonth*

HETZEL, Alice M. **Health Survey of the Trust Territory of the Pacific Islands.** *U.S. Armed Forces Med. J.* 1959, Oct., v. 10, No. 10, 1199–222, 1 fig.

In 1948 a United States team began a health survey of the inhabitants of the Trust Territory of the Pacific Islands. This report gives the findings for the districts comprising western Caroline Islands, the northern Mariana Islands except two, and the eastern Marshall Islands. The survey included a physical examination of almost all the inhabitants, together with X-ray examination of chest, Kahn and tuberculin tests and stool examination. Observations were made on environmental sanitation and on customs bearing on health. Before the survey an attack had been made on preventable disease and on low standards of sanitation; yaws had been controlled and intestinal parasitism reduced. Community latrines existed but pollution was still evident. Garbage was buried, burned or dumped at sea. Water supplies consisted of rainfall collected in old oil drums, supplemented by surface water sources. Some vital statistics were estimated; the birth rate was calculated as 24 with a range from 19·2 to 31·7. Over one-third of the population was aged under 15 years and one-fifth was 45 years or over.

Some 10,000 stools were examined and intestinal parasites were recorded in 52·4%, one-fifth being multiple infections. The most common parasites were hookworm (23·1%), *Trichuris* (22·3%) and *Ascaris* (17·2%). *Trichuris* incidence was the same in all age-groups, but hookworm increased and *Ascaris* decreased with age. Kahn tests were made on 16,320 persons and about 50% were positive. Many of these had old yaws scars. Syphilis was almost absent and examination of urethritis in men showed it to be mainly non-gonococcal. Miniature radiography was performed on 82% of the population; 4·5% were found to have chest defects and 1·3% were suspected of active tuberculosis, the incidence of which increased with age. Tuberculin tests on 90% of the population showed positive results in 46·5%, again directly correlated with age. Skin diseases were numerous, particularly fungal infections. Pterygium and conjunctivitis were very common, and also acute respiratory infections. Leprosy was diagnosed in 86 cases (25 lepromatous) and a further 83 cases were clinically suspected. Only 11 malignant tumours were seen in 325 neoplasms. Vitamin deficiency and anaemia were 8·8 and 8·4 per 1,000 respectively. *T. H. Davey*

BOOK REVIEWS

FENSOM, M. [S.R.N., S.C.M., M.T.D.] **Midwifery. The Oxford Handbooks for Medical Auxiliaries.** pp. xiv + 96, 21 figs. 1959. London: Oxford University Press, P.O. Box 156, Amen House, Warwick Square, E.C.4.

This series of Oxford Handbooks is being prepared for medical auxiliaries and is intended for use in tropical countries where the organized training of

medical assistants and dispensers, as well as nurses and midwives, calls for specially planned textbooks.

Miss Fensom's handbook on midwifery has been so planned. It is written in simple English and deals with the essential practical details of normal pregnancy and labour and with most of the abnormalities and complications which the midwife is likely to meet.

Because it is well written and fulfils its purpose well there are only a few imperfections upon which to comment. For example, the early part of Chapter Seven, particularly the paragraphs which explain the anatomy and physiology of the newly born baby's skull could, with advantage, be included in the introduction, so that when such terms as " occiput " and " sutures " are met for the first time in the text, the meaning of these terms will already have been explained. For those who may be working in rural areas in some tropical countries the frequent emphasis on the need to send for the doctor or to take the patient to hospital is made to sound too easy to be of maximum help. Medical aid is not always readily available and the nearest hospital may be many miles away. Some advice in every case on what, if anything, the midwife can or should not do in the absence of these facilities would add considerably to the usefulness of the book. In the same way it would be an advantage if more details could be given of such simple procedures as tying the cord and of the preparation for labour in a patient's home where sheets, a bath and plenty of water which has been boiled are not available.

These points do not seriously detract from the value of the book to those for whom it is written, however. It meets a great need and can be recommended particularly to those who are responsible for the training of midwives in tropical countries. *Florence N. Udell*

WORLD HEALTH ORGANIZATION. **Pharmacopoea Internationalis. 1st Edition. Supplement. Recommended Specifications.** pp. xx + 224, numerous charts. 1959. Geneva: Palais des Nations. [Sales agent for U.K., H.M. Stationery Office.] [25s.; $5.00; Sw. fr. 15.–.]

[Review appears also in *Bulletin of Hygiene*.]

This Supplement completes the first edition of the International Pharmacopoeia; volumes I and II were published in 1951 and 1955 respectively [see this *Bulletin*, 1952, v. 49, 341 and 1956, v. 53, 515].

Among the 94 new monographs are hormones, antibiotics (tetracycline, erythromycin and polymyxin B), antiseptics (benzalkonium and cetrimonium), contrast media (acetrizoic and iopanic acids) and newer preparations such as ethyl biscoumacetate, chlorcyclizine, chlorpromazine, hexamethonium, nalorphine and hydrocortisone. There are also a few simple chemicals such as borax, boric acid, potassium nitrate and zinc oxide for which standards have been found to be necessary. The new monographs for substances used in the tropics include chloroquine sulphate, primaquine diphosphate, pyrimethamine, diethylcarbamazine, suramin, diodoquin and gamma benzene hexachloride.

The 17 appendices cover the necessary control tests and dosages of the drugs described in the new monographs and bring the list of International Standards up-to-date. In addition, there is a description of a rapid test for alkalinity, lead and arsenic in glass containers for injections, and a section on the determination of *p*H. From a useful set of diagrams in Appendix 7, it is easy

to find the amount of sodium chloride which needs to be added to a solution of a drug to give an isotonic solution suitable for injection.

Some amendments to the previous volumes are presented in an annex and there is a comprehensive index to the whole first edition. The format, paper and binding are uniform with volumes I and II.

In the structural formulae which accompany the monographs positive charges have been located on nitrogen atoms in the salts of basic substances. This is satisfactory for the quaternary ammonium compounds but is of doubtful validity for substances containing more than one primary, secondary or tertiary nitrogen atom, because there may be uncertainty regarding the site of protonation. Thus an error has resulted in the instance of diethylcarbamazine citrate, in which the proton has been assigned to the feebly basic amido-nitrogen atom.

The International Pharmacopoeia is published by the World Health Organization to provide acceptable specifications for medicinal substances and serves as a guide to national authorities in the establishment of legal standards. It is available in English or in French and a Spanish edition is in preparation.

L. G. Goodwin

COUNCIL INTERNAT. ORGANIZATIONS MED. SCI.: MIDDLE EAST SCI. CO-OP. OFFICE UNESCO. **A Laboratory Manual on Abnormal Haemoglobins** [JONXIS, J. H. P. & HUISMAN, T. H. J. (prepared under the direction of)]. 39 pp., 12 figs. 1958. Oxford: Blackwell Scientific Publications. [9s. 6d.]

Many of the discoveries of new haemoglobin variants have been made in laboratories far away from the main centres of research, and it is in such places, too, that the need is felt to apply the newer knowledge of haemoglobinopathies, yet information about the necessary techniques is not always easy to come by. This brief Manual is designed "to stimulate and guide field observations on the occurrence of abnormal haemoglobins, particularly in Asia and Africa where so many new discoveries have recently been made". To this end it opens with a very brief outline of the haemoglobinopathies, but it consists mainly of concise descriptions of the laboratory methods that are now standard practice. Its practical nature is exemplified by the fact that 4 different ways are described of preparing blood samples for mailing, while the use of the Tiselius apparatus is illustrated, and documented, but the apparatus itself is not described.

The methods that are treated in detail are: zone electrophoresis on paper (between plates and by hanging strip), starch block electrophoresis, resin chromatography, determination of the solubility of ferrohaemoglobin, and determination of alkali resistance (photometric and chemical). Strict adherence to the instructions given will produce satisfactory results, but there is only scanty reference to the kinds of errors and artefacts that the worker in the tropics is sure to meet; and there is no reference to what can be achieved with capillary blood samples. Some of the treatment is a little hasty; for example, in the section on the demonstration of sickling the statement "Great differences are found between the shape of the sickle cells obtained from patients suffering from sickle cell anaemia or sickle cell trait" is not amplified to acquaint the reader with the long filaments seen in the former condition.

A composite table sets out comparative biochemical characteristics of human haemoglobins A to M and another table lists chemical and haematological features of human haemoglobin abnormalities.

For good measure, some standard haematological methods are included, but these do not add greatly to the value of the book, which is sufficiently established by its being the only one in the field, and by its conciseness, neat format, and low price. *Alan B. Raper*

MATTES, O. & WIGAND, R. **Helminthen und Helminthiasen des Menschen.** [Helminths and Helminthiasis of Man] pp. viii + 474, 130 figs. 1958. Jena: Gustav Fischer Verlag.

The appearance of a new treatise on human helminthology marks an event of considerable importance in the spheres of both parasitology and tropical medicine. Among those books in the German language devoted to this subject this new arrival is assured of a premier place, for it is a well-turned-out volume on art paper and appears to be singularly complete. This up-to-date narrative is based upon a somewhat similar work by SZIDAT and WIGAND (*Leitfaden der einheimischen Wurmkrankheiten des Menschen*, 1934, Leipzig: Thieme), but the present volume concerns itself not only with the strictly human helminths, but also with those which normally are found in wild or domestic animals and which occasionally infect man as well.

Some illustrations have been borrowed from STEMPELL's well-known work on the animal parasites of man (*Die tierischen Parasiten des Menschen*, 1938, Jena: Fischer), but the larger number is from original sources. The introductory portion deals with a discussion on parasitism in general, followed by the technique of faeces, urine and sputum examinations, other investigations and, finally, with procedures for preservation of specimens.

Under Trematoda, *Dicrocoelium*, *Opisthorchis*, *Heterophyes*, *Paragonimus*, *Fasciola*, *Echinostoma* and *Schistosoma* are discussed, among the Cestoda, *Diphyllobothrium*, *Davainea*, *Dipylidium*, *Hymenolepis*, *Taenia*, and among the Nematoda, *Strongyloides*, *Rhabditis*, *Ancylostoma*, *Ternidens*, *Oesophagostomum*, *Syngamus*, *Trichostrongylus*, *Metastrongylus*, *Enterobius*, *Ascaris*, *Gongylonema*, *Gnathostoma*, *Physaloptera*, *Filarioidea*, *Dracunculus*, *Trichinella* and *Trichuris*. Rarer forms are the Acanthocephala and Nematomorpha.

The reviewer is unable to find any fault with this book. It is extremely accurate and packed with authentic information and, of course, deals, *seriatim*, with all the tropical forms. The descriptions are somewhat brief and the reviewer is left with the feeling that some of his favourite parasites such as *Wuchereria bancrofti* and the schistosomes receive, comparatively speaking, rather short shrift. On the other hand space is taken up with an appendix which deals with the Acanthocephala, leeches and bibliography.

Philip Manson-Bahr

SHEPARD, Harold H. [Editor.] **Methods of Testing Chemicals on Insects. Vol. I.** pp. iv + 356, illustrated. 1958. Minneapolis 15: Burgess Publishing Co., 426, So. 6th St., Minn., U.S.A. [40s.]

This book is the first of a proposed series of three volumes on entomological testing methods compiled and edited by H. H. Shepard of Arlington, Virginia, at the instigation of the Entomology Subcommittee, Chemical-Biological

Coordination Center of the National Research Council of the U.S.A. It comprises 14 articles written by many well-known experts in the field of insecticide research, mostly American agricultural entomologists but including two articles by British agricultural entomologists.

The first two articles deal with the insect cuticle as the site of penetration of the insecticide. In the first, the nature of the cuticle, in particular the outer lipoid layer of the epicuticle, in relation to the adherence and penetration of insecticides is considered. Factors dealt with include wettability, permeability and adhesion. The second deals solely with the problem of penetration of the cuticle and considers among other things the qualitative and quantitative ways of determining penetration.

A third article deals with respiratory mechanisms in insects and ways of measuring oxygen consumption and the respiratory quotient. Some discussion is given of the possible ways in which insecticides may affect respiration.

Chapter 4 describes in some detail techniques for making electrophysiological preparations from the American cockroach. This is a comparatively new basic physiological approach to the study of the mode of action of insecticides and the phenomenon of resistance.

In the fifth article a general account of the insect circulatory system is given and its three parts: blood cells, plasma and heart separately considered. Techniques of study are given in detail.

The very important subject of radioactive tracer methods is reviewed in the sixth article. The use of radioactive tracers in studying the penetration, distribution, storage, excretion and metabolism of insecticides is discussed and the methods of application, preparation of material for radioassay, identification of absorbed chemicals and radioactive detection equipment are dealt with.

Resistance studies are the subject of chapter 7, and methods of testing for resistance in such species as California red scale, codling moth, house-flies, cockroaches, salt-marsh mosquitoes, the blue tick and body lice are given. Methods used for developing resistance in the laboratory in California red scale, house-flies, screw-worm, *Drosophila* and cockroaches are also described. No mention is made of the important work going on in various parts of the world on resistance in anopheline mosquitoes, or of the World Health Organization testing techniques employed for the detection of resistance in some of the insect pests of medical importance.

In the eighth article a very clear account is given of methods of topical application and injection. Aspects dealt with include applicators, needles, solvents, anaesthesia, the selection, handling and counting of the test insects, the volume of solution administered, the site of application or injection, dosage-mortality curves and applications to research. Three very useful tables are included in this article, one giving the median lethal concentrations of various insecticides for both topical application and injection of the cockroach, house-fly, *Oncopeltus, Melanoplus, Bombyx* and *Apis*, another listing the solubilities of insecticides in solvents and one giving the average weights of some common insect pests.

Feeding and drinking methods used in evaluating the toxicity of ingested chemicals are described in the ninth chapter. Both methods are considered where unlimited and limited quantities of the chemicals are provided. The various methods of making the chemicals available to many different insect pests are listed.

Chapter 10 describes 11 variations of dipping techniques for testing insecticides, dating from 1923 to the present decade. The various advantages and disadvantages of these techniques are discussed.

Occupying about one-third of the whole volume is a very thorough account of laboratory methods of precision spraying by two British authors. Three kinds of apparatus are considered:

(a) those for application of equal doses of poison directly to the bodies of the test insects,

(b) those for distribution of measured doses of poison equally over a surface, and

(c) those for application of measured doses of poison to the normal habitat, *e.g.* food plant, of the insect.

Details of apparatus are given with numerous useful diagrams, and lengthy discussion is made of various factors influencing results such as species specificity, nutrition, population and individual variations, location of dose, physical state of poison and medium in which it is applied, deposit level and concentration, inspection time and exposure, temperature, humidity, substratum etc.

Three methods of precision dusting are dealt with in the twelfth article. These involve immersion, exposure in a dust cloud and exposure to a uniform dust deposit.

Chapter 13 deals with the testing of fumigants. A variety of apparatus is described ranging from the simplest Erlenmeyer flask to large fumigating chambers with temperature and humidity controls. Like the article on precision spraying this chapter is well illustrated with diagrams and photographs.

The final article deals with the subjects of synergism and antagonism. The terms are defined and subdivisions where similar and dissimilar joint actions and independent and dependent action of mixtures of chemicals are involved are considered. Testing techniques and methods of interpretation of results are also given.

There is considerable similarity in content between this book and one produced by BUSVINE in 1957 entitled *A Critical Review of the Techniques for Testing Insecticides* [this *Bulletin*, 1958, v. 55, 608]. Perhaps the volume here reviewed has some advantage in having the separate aspects of an intricate subject dealt with by individual specialists, and one looks forward to further volumes on this most important subject perhaps with more emphasis on medical entomology than is shown in this first volume. *G. Davidson*

HOEPPLI, R. [M.D., D.Sc.] **Parasites and Parasitic Infections in Early Medicine and Science.** pp. xiv + 526, 23 pls. 1959. Published for University of Malaya Press, Singapore, by London: Oxford University Press, Amen House, E.C.4. [63s.; M$25.00.]

Dr. Hoeppli explains that while a staff-member of the Peking Union Medical College, 1930–52, he collected material dealing with parasitological subjects from early Chinese writings, and based on this he published a number of historical studies in parasitology. In this volume he brings together the subject-matter of these papers, as well as hitherto unpublished material of Chinese origin. His survey, however, far from being limited to the Chinese region, ranges over the classical field where names like Hippocrates, Aristotle, Galen,

Celsus, among many others, crop up repeatedly; and from here the story carries on to what can be regarded as the dawn of modern parasitology, ushered in by the introduction of the microscope.

Although the existence of the common ecto- and endoparasites was recognized in ancient times, and indeed could hardly have been overlooked, it is curious to find the wide-spread belief that these arise from spontaneous generation, the result of some bodily derangement and not its cause. Even Guy de Chauliac, who knew of the presence of animalcules in scabies, did not consider them as causing the disease: and the belief in spontaneous generation lasted up to the seventeenth and eighteenth centuries, and in some cases even later.

The presence of parasites, if not too numerous, was often held to be beneficial to the host; intestinal worms, for example, by utilizing surplus food and mucus, which otherwise would putrify, were thought to prevent the onset of disease. In addition, the movements of these parasites were supposed to stimulate peristalsis and strengthen the intestine. Scabies induced by wearing an infested shirt was long advocated as a cure for asthma; and scabies similarly transferred was a treatment for insanity, even as late as the eighteenth century, the argument being that the peripheral irritation from the skin counteracted the cerebral irritation responsible for the mental attack, thus enabling the brain to resume its normal working. But the strangest of all the beliefs in the beneficial effects of parasites was the primitive one recorded from the East, namely, that an infestation with several worms was necessary to preserve life; a theory possibly suggested, it seems to the reviewer, by the observation that in severe fevers dead roundworms may be passed by the sufferer, an event that in old times was often thought to foretell death.

Just as if there were not already a sufficiency of genuine parasites, the imagination got busy and invented others—the "tooth-worm" which was supposed to cause toothache, a belief strengthened by the practice of using winter-cherry seeds as a remedy, for the heating of the seeds in the course of application expelled the plant embryos which superficially looked like tiny worms. Even a stranger pseudo-parasite was the lytta in the tongue of the dog, believed to be a worm and responsible for madness; its excision as a preventive measure was so common that literary mention of worming of dogs, as in Scott's novels, refers more often to this operation than to worming for intestinal infestation.

Dr. Hoeppli points out that his volume is not a systematic history of parasitology arranged in chronological order, but rather a series of loosely connected essays each dealing with a special aspect of early parasitological experience or belief. Whatever the author's purpose, his readers cannot fail to be amazed at the wealth of knowledge set before them, and at the industry and erudition which have made this assemblage possible. *W. P. MacArthur*

NOTICE

ROSS INSTITUTE OF TROPICAL HYGIENE

Lay Course in Tropical Hygiene

To be held from 4th to 8th July 1960

The annual course for laymen will be held by the Ross Institute this year from Monday, 4th July to Friday, 8th July inclusive.

The course is designed specially for planters, mining engineers and other non-medical people who may be responsible for the health of industrial labour forces in the tropics. Admission is not restricted to such people, however, but is open to any non-medical men and women proceeding to the tropics.

The course consists of some formal teaching which is liberally illustrated by films, visits and demonstrations. The subjects covered include malaria and its control, other tropical diseases, nutrition, housing, sanitation, and protection against heat. The teaching is given by leading experts in each subject.

There is no fee for the course. Recognising its value, many companies pay the expenses of their staff during their stay in London, and the Ross Institute Standing Committee hopes that this practice will become general.

It would be appreciated if agencies and firms would inform their managers and assistants that this course is being organised and would encourage and assist them to attend. The names of those proposing to attend should be sent as soon as possible to the Organising Secretary, but amendments and additions may be made at any time up to the date of commencement of the course.

It would be helpful if intending students would state their occupation and the country or district to which they are going. This will enable the organisers to arrange the programme according to requirements.

Further information on the detailed arrangements will be sent to those who have enrolled about a month prior to the date of the course.

Further copies of this notice will be sent on request to:—L. G. PONSFORD, *Organising Secretary*, Ross Institute of Tropical Hygiene, London School of Hygiene and Tropical Medicine, Keppel Street (Gower Street), London, W.C.1. *Telephone*:—MUSeum 3041–4. LANgham 7621–5.

Printed in Great Britain by The Eastern Press, Ltd., London and Reading